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FRANK KOHNE

BURGESS HURD

"Ceramic" Service short-cuts the process of getting colors that fit smoothly into your production routine. For, whether your order is for matching a color or repeating an order of months or years ago, the color has to stand the "test by fire" in our kilns, which are adjusted to simulate your operating conditions. You can count on it for high productivity and consistent trueness to shade—factors that help to control production costs and get and keep satisfied customers.

Meet us at the A. C. S. Convention

Bill Wenning, Frank Kohne, and Burgess Hurd will be in our New York Statler quarters to greet you. Bring your color problems with you.

WENNING CERAMIC COLORS

"Ceramic" Colors

CERAMIC COLOR & CHEMICAL MFG. CO.

New Brighton, Pa., U.S.A.

OPAX S
in High Fire Zirconamels

REFLECTANCE VALUES INCREASED UP TO 2%

The superior qualities of OPAX S as the mill addition opacifier in the new super-opaque type zirconamels are well-known to many leading enamelers. From practical experience it has been found that its use results in increases in reflectance. Uniformity of color is assured. Scumming, as a result of over firing, is eliminated. High abrasion resistance is revealed by results of tests of Tabor Abrasion Apparatus.

Our trained field engineers are available to assist in the application of OPAX S. They welcome the opportunity to work with you.

High Scratch Resistance

Color Stability

Improved Finish

Typical High Fire Zirconamels

COMPARISON OF REFLECTANCE VALUES WITH TYPICAL HIGH FIRE* ZIRCONAMELS

TYPE	MILL ADDITION OPACIFIER	Reflectance values at application weight of		
		35 grams /ft²	40 grams /ft²	45 grams /ft²
A	No Opacifier	74.8	77.0	78.8
	2% Opax S	76.0	78.0	79.8
B	No Opacifier	75.0	77.0	78.4
	2% Opax S	76.5	78.8	80.4

*Increases in Reflectance Values with Low Fire Zirconamels are approximately the same.

TAM PRODUCTS
Registered U. S. Pat. Off.

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TITANIUM ALLOY MFG. DIVISION
NATIONAL LEAD COMPANY
Executive and Sales Office: 111 BROADWAY, NEW YORK CITY · General Offices, Works, and Research Laboratories: NIAGARA FALLS, N. Y.

Discover how wonderfully small trifling expenses mount up to large sums.

—Ben Franklin's Almanac, 1757

A single per cent saved here and another per cent saved there strengthens thy working capital for the coming year.

—Acme Steel's Notebook, 1950

Look, Mr. Management, how long has it been since you walked through your shipping room and checked up on your packaging operations?

How long since you sharpened your eye and your pencil on ways to save in shipping and materials handling?

Helping you save money, time, materials, labor is where Acme Steel comes in. Nine out of ten companies start cutting costs when they reach for the telephone and call in one of our sales engineers and get the benefit of what we have learned to do with Acme flat steel strapping, Acme stitching machines and wire, and other Acme Steel products.

We show you here two specific examples of savings by our customers. If you want more evidence, we have hundreds of actual case studies to show you. In fact, more than 45,000 Acme customers are getting the benefits of Acme Methods now. Call the Acme Steel service office nearest you. (There are 45 of these offices in the principal cities of the U.S. and Canada.) Or send the coupon below for more details on your special problems.

OLD WAY: 20c per package
ACME STEEL WAY: 2½c per package
SAVINGS: 87½%

Milwaukee firm securely bundles 20 electric fence posts and insulators with three pieces of Acme Steelstrap.

Material costs cut 43%
Labor costs cut 50%
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In addition, Acme Box Stitching Methods improved carton strength and durability for Connors Brothers, Ltd., sea food canners in Newfoundland.

ACME STEEL

Under the American business system of open competition, Acme Steel has enjoyed sound, steady growth. Since 1901, Acme Steel has made 283 consecutive dividend payments to its stockholders.

ACME STEEL CO. CHICAGO

ATTACH THIS COUPON TO YOUR BUSINESS LETTERHEAD

ACME STEEL COMPANY, Dept. FI-40, 2840 Archer Avenue, Chicago 8, Illinois
We manufacture _____. Please send me booklets on Acme Methods checked.

- ☐ Please have sales engineer call.
- ☐ **Packaging, Shipping, Materials Handling**—"Savings in Shipping" tells how to save money and safeguard customer good will with Acme Steelstrap.
- ☐ **Shipping (Carload and L.C.L.)**—"Acme Unit-Load"—The story of reduced damage claims and better handling for shippers.
- ☐ **Bag and Box Assembly**—"Profit by Stitching" demonstrates cost-cutting Acme Silverstitchers and Acme-Champion Stitchers.
- ☐ **Product Assembly**—"Acme-Morrison Metal Stitchers"—for savings in fastening metal-to-metal or metal-to-other materials.
- ☐ **Book Assembly**—"Acme-Morrison Book Stitchers" for savings in the graphic arts field.

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ACME STEEL CO. CHICAGO

From the Editor's mail . . .

chemical polishing

Gentlemen:

I was particularly interested in the last issue received to read the article on "Chemical Polishing of Metal Products." We have been following developments in Electro Polishing, but so far, owing to the high current density required, we have not found any application for which this would be cheaper than manual polishing.

If there is any more information, therefore, on this Chemical Polishing, without an electric current, I should be very much obliged if you would tell me where I can get hold of it. I know of no other magazine from which we get so much good value . . .

M. Simpson
A. Simpson & Son, Ltd.
Adelaide
South Australia

fine article on reduction of loss and damage and freight claims

Dear Sirs:

Your treatment of loss and damage and freight claims in the January issue of **finish** was one of the finest articles and spreads I have ever seen given to these subjects.

John G. Borson
Traffic Manager
Hotpoint, Inc.
Chicago, Ill.

automatically on mailing list

Gentlemen:

It is the request of the President of our company that his name be placed on your mailing list to receive a copy of your publication **finish** each month.

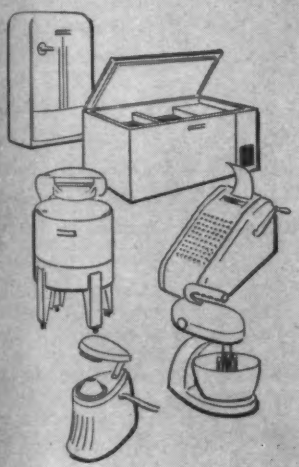
Kindly see that this is addressed to Mr. J. W. Hart, President, McCray Refrigerator Company, Kendallville, Indiana.

Your cooperation in seeing that the

to Page 8 →

HERE'S WHY SUPERCLAD*

opens NEW FIELDS...NEW PROTECTION... FOR APPLIANCE FINISHES!



Alkalies, acids and other chemicals can play havoc with the toughest of ordinary finishes. The photographs above show two-coat systems on black iron buckets, using conventional appliance enamels, air-dry and baked . . . and SUPERCLAD. See what happened when the buckets were filled with 10% caustic soda and 10% sulfuric acid solutions!

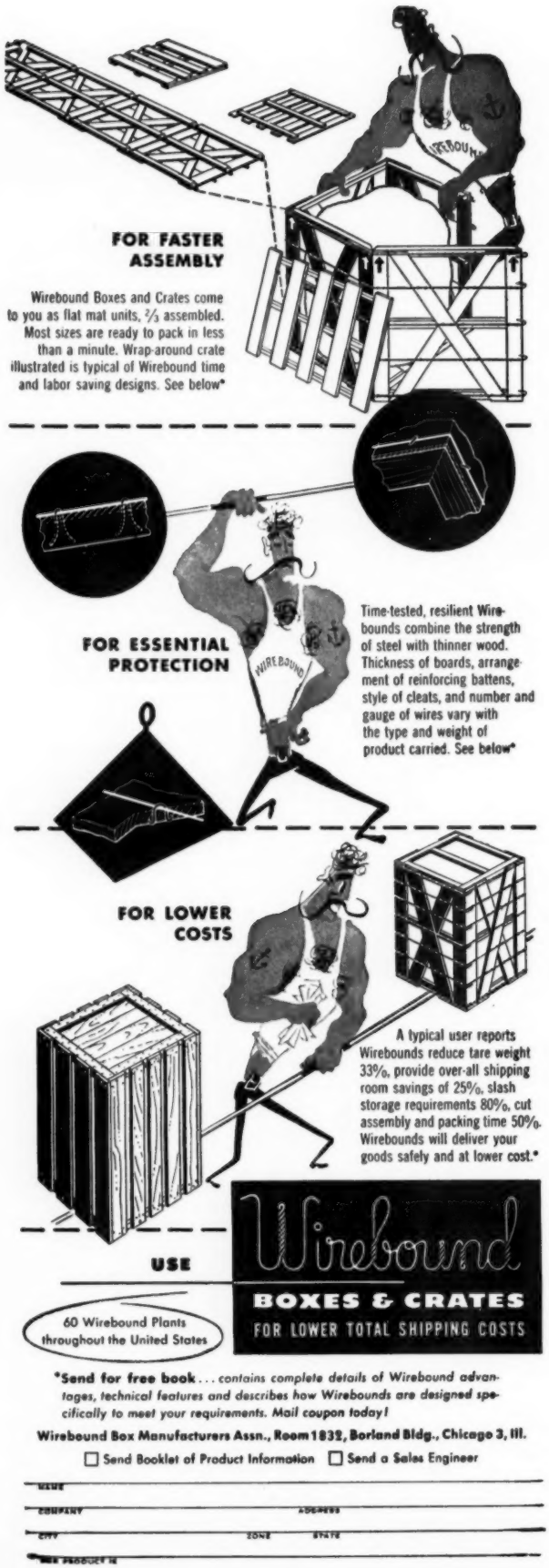
The air-dry enamels were destroyed in less than 1 day. The conventional baked enamels were destroyed in 2 days. *SUPERCLAD has withstood 10% caustic and 10% acid solution for OVER 3½ YEARS!*

This remarkable resistance opens the way to new, lasting protection for many types of products. If you want beauty, elasticity, resistance to chemicals . . . humidity . . . abrasion . . . impact—YOU WANT SUPERCLAD! Get the full story on this and other outstanding Sherwin-Williams Appliance Finishes. Write The Sherwin-Williams Co., Industrial Division, Cleveland 1, Ohio.

*Trade-Mark

SHERWIN-WILLIAMS SUPERCLAD* APPLIANCE FINISHES

ANOTHER PRODUCT OF SHERWIN-WILLIAMS INDUSTRIAL RESEARCH


FOR FASTER ASSEMBLY
Wirebound Boxes and Crates come to you as flat mat units, ⅔ assembled. Most sizes are ready to pack in less than a minute. Wrap-around crate illustrated is typical of Wirebound time and labor saving designs. See below*
FOR ESSENTIAL PROTECTION
Time-tested, resilient Wirebounds combine the strength of steel with thinner wood. Thickness of boards, arrangement of reinforcing battens, style of cleats, and number and gauge of wires vary with the type and weight of product carried. See below*
FOR LOWER COSTS
A typical user reports Wirebounds reduce tare weight 33%, provide over-all shipping room savings of 25%, slash storage requirements 80%, cut assembly and packing time 50%. Wirebounds will deliver your goods safely and at lower cost.*
USE
Wirebound
BOXES & CRATES
FOR LOWER TOTAL SHIPPING COSTS
60 Wirebound Plants throughout the United States
*Send for free book... contains complete details of Wirebound advantages, technical features and describes how Wirebounds are designed specifically to meet your requirements. Mail coupon today!
Wirebound Box Manufacturers Assn., Room 1832, Borland Bldg., Chicago 3, Ill.
Send Booklet of Product Information
Send a Sales Engineer
ISSUE
COMPANY
ADDRESS
CITY
ZONE
STATE
WE PRODUCE IN

→ *from Page 6*

above is handled properly will be greatly appreciated.

W. L. Herald
Advertising Manager
McCray Refrigerator Co.
Kendallville, Indiana

simultaneous with the announcement that Mr. Hart was named president of McCray, his name was automatically placed on our circulation list for regular copies.

---

not for the waste paper basket

Dear Sir:

. . . As my comments state, your magazine is very well thought of here on the Coast by the particular plants which we call on. We appreciate the acceptance by management and men in the plant of your magazine . . . So many magazines of the type of circulation which you have wind up in the waste basket almost immediately, but yours is quite to the contrary.

Frank W. Fernholtz
Fernholtz Machinery Co.
Los Angeles, Calif.

---

the March editorial

Dear Dana:

I saw the paragraphs under "What To Do About It," and silently commended you. Now I'll directly commend you for this constructive effort. Good work—for all of us.

FINISH has made grand strides since that infant issue I remember so well. You have made good on your every prediction of helpfulness to the industry—and then some!

A Regular Reader

---

valuable for new developments

Dear Sirs:

FINISH is very valuable in helping me to keep up with the latest developments in the porcelain enamel field. I appreciate your sending it to me.

Harry Whittaker
Mineral Products Research
Fanwood, New Jersey

THE finish LINE

THE OPEN HOUSE — is a method of business building that has proved its value in many businesses. It is particularly well suited to appliance selling. Are your dealers using it?

Phil S. Hanna presents many success stories about small businesses (many of them have *started* small and grown large) in his ever-popular column appearing regularly in the Financial Section of *The Chicago Daily News*. With his permission we reproduce a current story that should interest every appliance manufacturer.

KEEPING CHICAGO GREAT

Open House Boosts Appliance Sales

BY PHIL S. HANNA FEB 2 3 1950

It's interesting how some of Chicago's little businessmen are learning to promote sales by holding "open house" affairs in their stores.

R. S. Campbell of 1943 Central st., Evanston, held a grand opening Saturday. He showed television sets, refrigerators, stoves, sewing machines and other appliances.

R. S. CAMPBELL

In the first hour he gave out 350 orchids to woman callers. He had 35 television sets connected up all playing the same program.

* * *

NINE FACTORY representatives sent demonstrators. Sunbeam demonstrated coffeemaking. Maytag had a washing machine demonstrator. Hyland Electric showed how the dishwasher works. Hotpoint demonstrated a mangle. A SewEasy sewing machine was also there.

Then each caller picked a key from a box. The right key opened a padlock chaining a toaster and coffeemaker prize.

The big prize contest was for an Admiral television set to be given later for the best essay on "Why I want a television set." Campbell will get plenty of prospects from the prize contest.

So successful was this "grand opening" that Campbell is planning another contest next summer. He will give a refrigerator free for the oldest refrigerator that can be found. More prospects.

* * *

BUT THE secret of his selling campaign is his own TV service organization. They don't pass the buck. His servicemen double as salesmen for TV receivers and refrigerators.

Even where sets are sold with a coin box attachment, Campbell sells his TV paper to the bank. The customer signs a negotiable partial payment contract.

But his own men collect the coins once a month, take the collections to the bank. Seldom does the money in the coin box fail to meet the payments.

A veteran, Campbell started in business in May, 1946, using his mustering-out pay for capital. From sales of $23,000 in 1946 he has advanced to a 1949 total of $200,000.

Check your own dealers

Read this story of the practical application of the "Open House" idea. Get the picture of healthy growth for a new dealer in appliances. Then picture a transposition of this result to all of your dealers who were doing business at the rate of $23,000 in 1946. See if all of your dealers of this size are now doing $200,000 annually.

See what your total sales would be today if all of your dealers *had* shown the same percentage of gain as in the instance of Phil Hanna's case history.

Are you helping?

The Open House is just one small part of a properly coordinated dealer promotion program. It is certainly indicative of a progressive selling attitude and one that would welcome and effectively use all proven sales helps.

The real question is: To what extent have you been helping to put your dealers in this position of progressive selling and sales promotion?

We have been "harping" on the necessity for sales training and sales promotion at the dealer level for months. This affords another opportunity. There never has been a time in recent years when attention to this phase of selling home appliances and allied metal products was more important.

We can sit back and groan about high labor rates, strikes, material shortages and all of the other alibis for lazy business or we can override these factors in many cases by a sound, progressive sales policy. Such a policy *must* include sales training from Management to Retail Salesman and should include a host of retail selling ideas such as the "Open House".

You will find a few ready-made dealers who are "fired" to do big things. For the most part, the results at the dealer level will depend on how much attention you give to the problem and how many good ideas you offer for getting prospects lined up and turning them into customers.

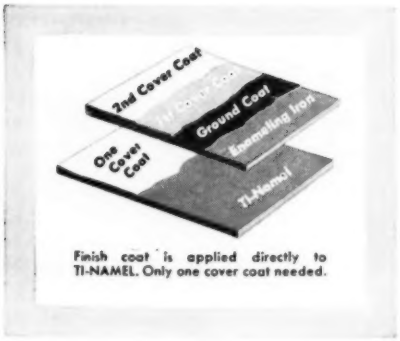
Dana Chase

EDITOR AND PUBLISHER

IMPORTANT *to Vitreous Enamelers*

Inland Ti-Namel

covers WHITE with only one coat

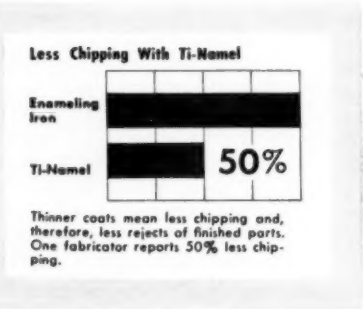


Finish coat is applied directly to TI-NAMEL. Only one cover coat needed.

When you can use TI-NAMEL with a thinner coat without sacrificing whiteness—that's profit-making news to you! This means less chipping in manufacture, in transit, and in use. It slashes shipping costs by permitting the use of lighter crates and reduces transit damage claims.

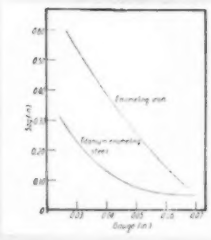
But that's not all. Users report considerable savings in the plant—savings in processing time, as well as savings in labor, frit and weight of steel. TI-NAMEL will not craze or fishscale. It will not blister or reboil.

TI-NAMEL has all of the production advantages of deep drawing sheets, plus remarkably high sag resistance. To find out if TI-NAMEL can help you turn out better porcelain enamel products at lower cost—write Inland Steel.



Thinner coats mean less chipping and, therefore, less rejects of finished parts. One fabricator reports 50% less chipping.

TI-NAMEL gives you the same degree of whiteness and opacity with less material and labor.



Higher Sag Resistance. TI-NAMEL won't warp even under high temperatures. Lighter gage sheets can be used safely, allowing worthwhile production economies.

TI-NAMEL has drawing qualities equal to deep drawing cold rolled sheets.

INLAND

INLAND TI-NAMEL® *Titanium-Bearing Killed Steel Enameling Sheets*

INLAND STEEL COMPANY, Dept. F40, 38 So. Dearborn St., Chicago 3, Illinois

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Using ceramic coatings for specialized applications

high temperature ceramic coatings prove useful for applications varying from pump cylinders to components for B-36 bombers and jet engines

by Walter Rudolph

Exclusive feature finish

Ceramic coatings, as we will discuss them in this article, are to be distinguished from ordinary porcelain enamels in that they have higher refractory and heat-resistant qualities. They are so compounded that they are fired at above-ordinary temperatures, and have melting points beyond their service heat.

Naturally one won't find a very large group of producers of ceramic coatings, as compared to the number of commercial plants engaged in porcelain enamel work. Although interest in ceramic coatings reached a high peak during the last war, it has since subsided and is presently relegated to a few factories around the country, most working on specialty items.

Unusual equipment and skills, as well as methods devised for particular jobs and small production lots, can be said to be required in ceramic coating. Perhaps an outstanding example of a combination of these requirements is found at Lorain Metal Treating Co., Lorain, Ohio. W. F. Stark is plant manager, and Joseph Smith, president. Only a handful of employees are needed, in a flexible and mutually satisfactory arrangement.

A "high altitude—high heat" problem

The firm's interest in ceramic coatings brought it one of the most interesting and challenging jobs in the field in March, 1949. Engineers from Consolidated Vultee, Fort Worth, Texas, where the Air Force's famed B-36 bomber is rolled from assembly lines, came a-knocking at the Lorain plant's front door.

Their problem was outlined as follows:

At 40,000 feet, where this bomber commonly operates, 12 devices (two on each of six engines) known as heat exchangers were developing failures after comparatively short usage. A heat exchanger picks up heat from exhaust gases and funnels it into plane compartments for heating, and into wings for de-icing purposes.

In a nutshell, edges of the material in use were eroding and burning away, at exhaust temperatures developed at high altitudes during bomber operation. This failure of a heat exchanger could cause carbon monoxide to leak into the plane's heating system, and could permit an excess of heat to pass into the de-icing equipment, projecting its failure.

We might further explain this by pointing out that lead, a by-product of the fuel used in the bomber, worked on the metal of the heat exchanger at high temperatures, causing intergranular corrosion of the alloy. Engineers, then, wanted to find a method of covering the metal to protect it.

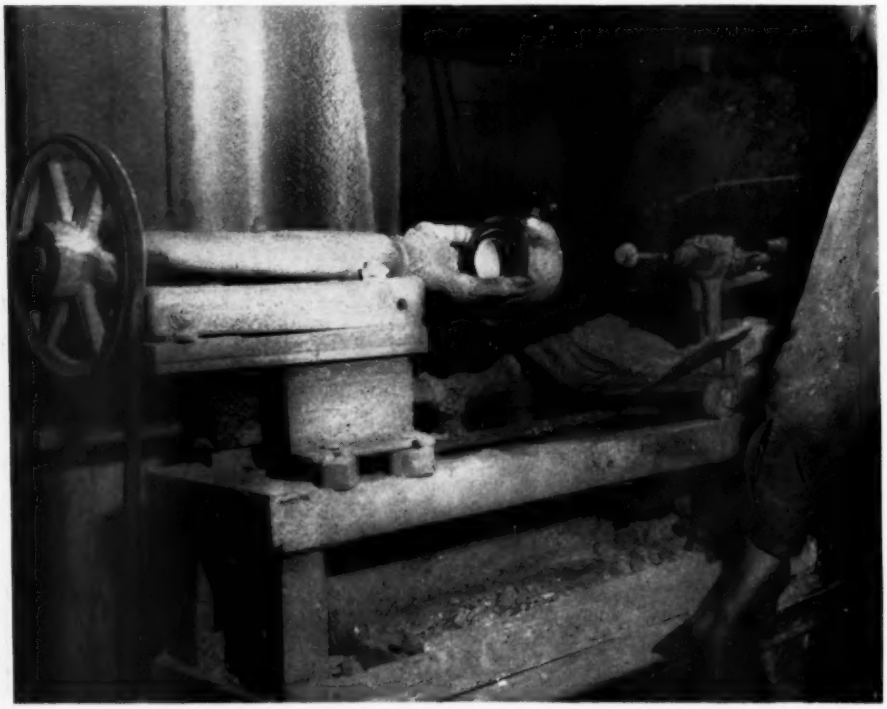
Technical laboratories "know-how" put to use

In Washington, the National Bureau of Standards had been doing research on ceramic coatings for high temperature protection of steel. *(See "Ceramic Coatings for Steel in High*

W. F. Stark, plant manager, and Joseph Smith, president, Lorain Metal Treating Co., consider the problem of ceramic coating on catalyst supports for chemical reactors.

Heat exchanger for B-36 bomber has ceramic coating flowed on with this simple arrangement. Work of this kind is not adaptable to mass production.

Close-up of special lathe for spin-coating pump cylinders with air power pushing and spinning spray nozzle, right, into cylinder clamped in fixture.



Temperature Service," February, 1947, finish.). The work was born of an effort to alleviate the war-time possibility of a shortage of alloy constituents, necessitating greater use of more plentiful steel.

Lorain was interested in this work, too, and had favorable cooperation from one of the universities working in the same field, that of the University of Illinois.

Jet engine parts coated

Lorain Metal Treating had coated a jet engine blade that was testing at about 2100° F., for the National Advisory Committee of Aeronautics. Stark showed Consolidated this test; it was checked in Washington, D. C., and then all the principals interested in the work huddled at the Lorain plant to figure out how to tackle the heat exchanger problem.

At first, used heat exchangers were sent to Lorain, and orders began to pile up. Of course, cleanliness of the metal was absolutely necessary, but it was possible to salvage some of the old units. Eventually it was decided to sand blast all units before coating.

Essentially, Lorain had to apply a ceramic coating that would adhere well to the metal, be thin for minimum weight and to minimize possible cracking due to accidental mishandling, would have no "reboil" (appearance of gas bubbles at or near 1100° F.), would protect the metal from oxidation at prolonged high temperatures, and, would have high resistance to thermal shock and to temperature gradients.

Preparation of the coating, application, and firing of the heat exchangers varies slightly from ordinary porcelain enamel ground coat procedure. Milling time is increased approximately 50% because of the fineness required for application. Coatings are applied to suitable shapes by spraying, but as the heat exchanger incorporates fins and many edges, Lorain devised a flow-application stand on which the units are individually coated.

Thickness of fired coating (on ordinary steel) should be 0.002 in. to 0.003 in., with 0.0025 being sought. Thickness greater than 0.003 in. may

be used, but heavier applications reduce thermal-shock resistance and are more conducive to blistering or breakage. Exchangers are set on a rack in front of a hot-air blower for drying before firing.

The box type furnace has a range of 3000° F., and measures 3 x 4 x 6 feet.

Firing time varies, naturally, with the furnace load. In sundry applications of ceramic coatings, the gauge of steel and size and shape of pieces are factors considered during firing. Small sample pieces of 18 gauge steel have been properly fired in 4 to 5 minutes.

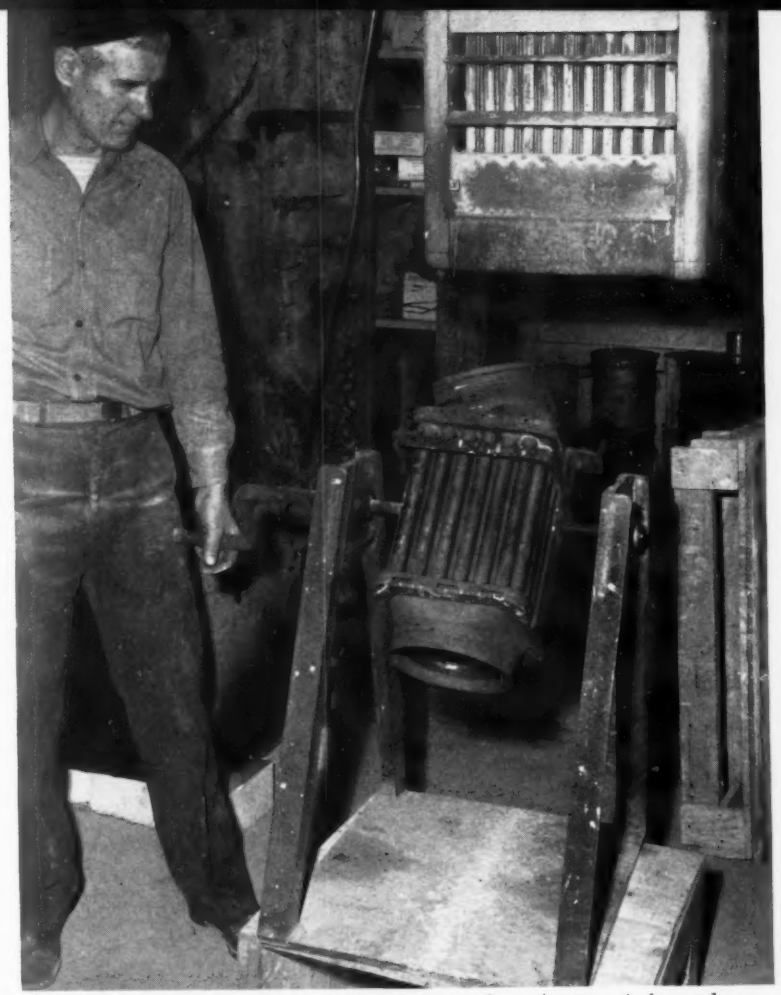
The work on heat exchangers developed units that have been used well beyond the former time limit under extreme use. Work continues along these lines. Lorain has gone on to do much experimental work involving the use of different base metals and ceramic coatings for the combatting of heat and/or chemical attack. Much of this work cannot be revealed.

Coating catalyst supports

One interesting job that is not under wraps involves ceramic coating of catalyst supports in chemical reactor set-ups for B. F. Goodrich Chemical Co. The latter wants a coating for the wire-web type pieces to prolong life and prevent contamination of the components in use. Solution of the problem is near at hand.

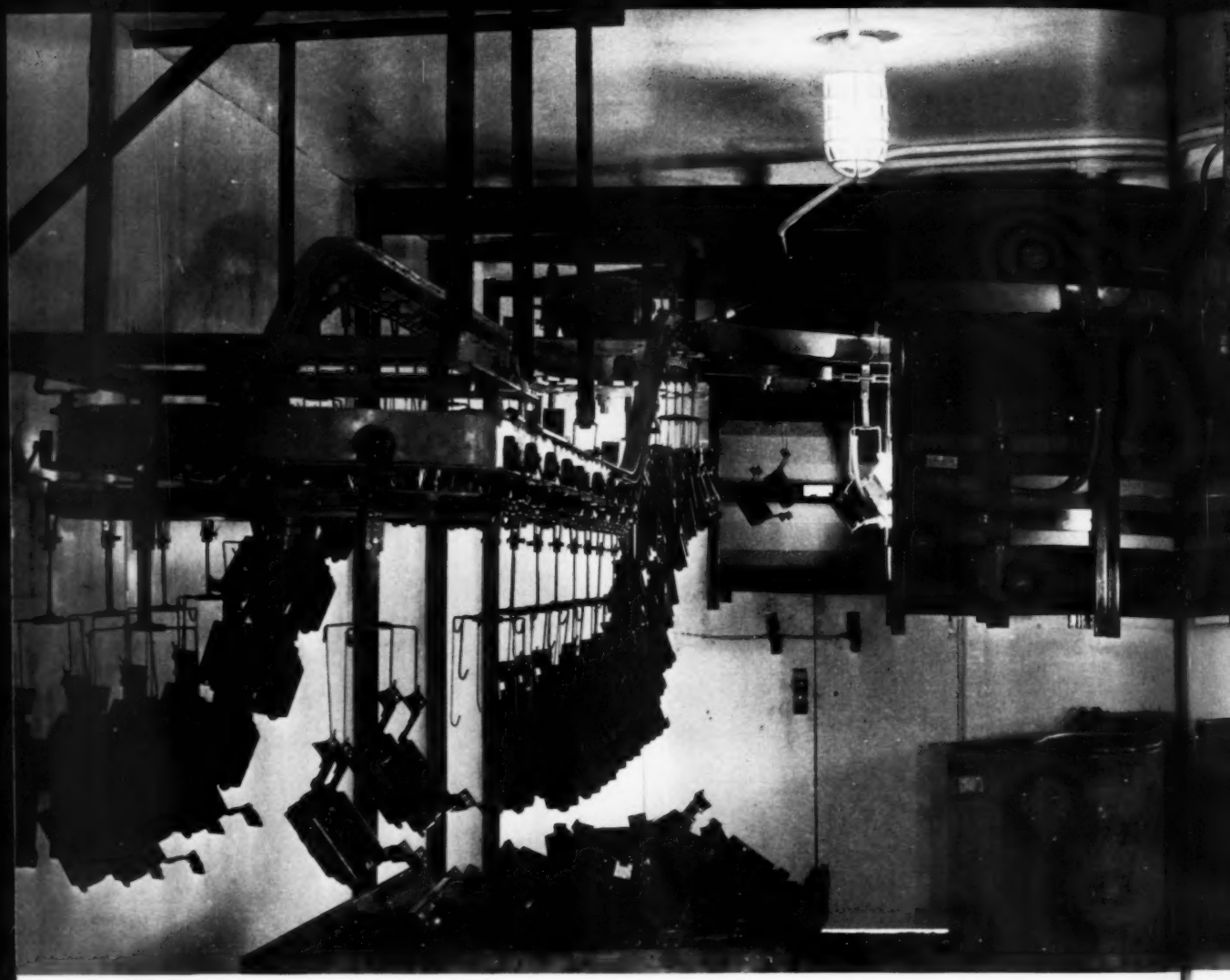
Another job that is more common to the field is the coating of pump cylinders. Bean, Hardy, Myer and others in the commercial pump production industry have arrived at the use of glass coatings in cylinders to increase the life of units. Here, custom job requirements are considered. Coatings run roughly from 0.007 in. to 0.010, and sometimes three are applied. From 0.030 in. to 0.035 in. overall coating is recommended.

Enamels are applied according to specifications as to hard physical or chemical wear. Many firms doing this work dip the parts to be coated, but Lorain has devised an air-powered, lathe-type spinning application, foot-controlled, which is said to give more uniform coating, and reduce brushing time considerably.



Turning rack rotates heat exchanger before a flow of warm air from above heating unit to "set up" ceramic coating slightly & give uniform coverage.

A load of pump cylinders and heat exchangers are shown on loading fork of special box type furnace having temperature range up to 3000° F.



How one firm reduced degreasing and finishing costs

describing a compact degreasing and finishing layout employing infra-red ovens

by W. S. Gwizdowski • AUTOMOTIVE STAMPING & MANUFACTURING CO., DETROIT

ONE of the production cost problems which we recently solved in our plant was in connection with the degreasing and painting of electrical outlet boxes which we manufacture. This operation had been performed by an outside source, but the unit cost was high and the results not entirely satisfactory.

An investigation was conducted into perchlorethylene and hot alkaline solution degreasing. Objections to each of these were found in toxic conditions ensuing, large space requirements, or extra boiler capacity necessary.

With the help of an infra-red equipment manufacturer, a room layout utilizing infra-red ovens for degreasing and baking was designed. There wasn't much space for such an installation in a 17 ft. x 31 ft. room, but that didn't make any difference as the ovens didn't require much space and the conveyor was located along the wall.

Production schedule

The boxes, fabricated of .075 steel, are hung on a variable speed con-

←Degreasing and finishing cycle is as follows: Continuous conveyor carrying ware enters infra-red oven (left center) for degreasing, leaves oven (right center) and takes ware through paint dip tank (not shown), and returns to infra-red oven (behind degreasing oven) for baking, with finished ware ready to be taken from conveyor at extreme left.

Photo below shows operator hanging ware on conveyor leading to degreasing oven. The same operator removes finished ware from conveyor.

veyor traveling at a rate of 2 feet per minute and leading into a 6 ft. 7½ in. long degreasing oven (36 kw and 375 watt lamps). Three minutes at 500° F. are allowed for burning the grease from the boxes. Cooling of the boxes takes place as the conveyor continues on to the paint dip tank. The paint used is synthetic black enamel, reduced with a synthetic reducer.

After draining, the boxes enter a 11 ft. long baking oven (24 kw and 250 watt lamps). Five minutes is allowed for baking. Cooling time is allowed, and the same worker who placed the unpainted boxes on the conveyor removes the finished work.

Although the room is comparatively small, the efficient layout leaves sufficient space for handling and storage.

Filtering and straining paints and varnishes

including basic principles of filtration, theory of filter aids, suggestions on filtering practice and a comparison of clarifying methods

by A. C. Kracklauer • PRESIDENT, SPARKLER MANUFACTURING CO., MUNDELEIN, ILL.

LIKE so many other problems in the paint and varnish industry today, the clarification and filtration of varnishes and lacquers, and the straining of pigmented enamels and paints can be a rather comprehensive subject if we were to consider the many details and technicalities that the subject presents. This article will be confined to some of the fundamentals of the overall problem.

Most paint and varnish manufacturers today are so fully aware of the importance of thoroughly clarifying paints and varnishes that we need spend very little time on this phase of the problem. We all appreciate that clarifying and filtering a varnish, resin, or paint not only improves its appearance but its intrinsic qualities as well. For instance, we know that filtering dirty insulating varnishes will improve their dielectric properties from 30 to 200 per cent, and their heat endurance 10 to 20 per cent. Or, again, a fine protective coating may be rendered pervious through minute dust or dirt particles present.

Basic principles of filtration

Before discussing the specific problem of filtering varnishes, the basic principles of filtration will be covered. Because, as is so often the case, once we understand the theory the application becomes almost automatic. Basically, filtering is the separation of fine solids from liquids or gases. If the solids are relatively coarse we usually refer to it as straining.

Up to 50 or 60 years ago, this separation was accomplished by means of a fixed septum or membrane having pores fine enough to withhold the solids to be removed, and large enough to permit the liquid to pass. It is easy to see what happened in those days when the solids being removed were of a colloidal or jelly-like nature as they so often are in varnishes or when the liquid being filtered had a high surface tension such as varnish.

In removing colors, odors, and tastes from liquids by means of kieselguhr, or powdered charcoal, the chemists of those days found that the throughput of a given filter area was increased somewhat when these powders were mixed with the liquid being filtered. The reason for this is the fact that the porous and crystalline nature of the charcoal particles tended to keep the slimy particles separated from each other as they were deposited on the filter paper or cloth. Some years later it was found that some of the diatom deposits in this country, due to their irregular shape, cellular construction and chemical inertness, proved to be remarkable filter aids. Once this discovery was made, the grading and purifying of these diatomaceous earths progressed rapidly so that today they are the finest and most efficient filter aids that we have.

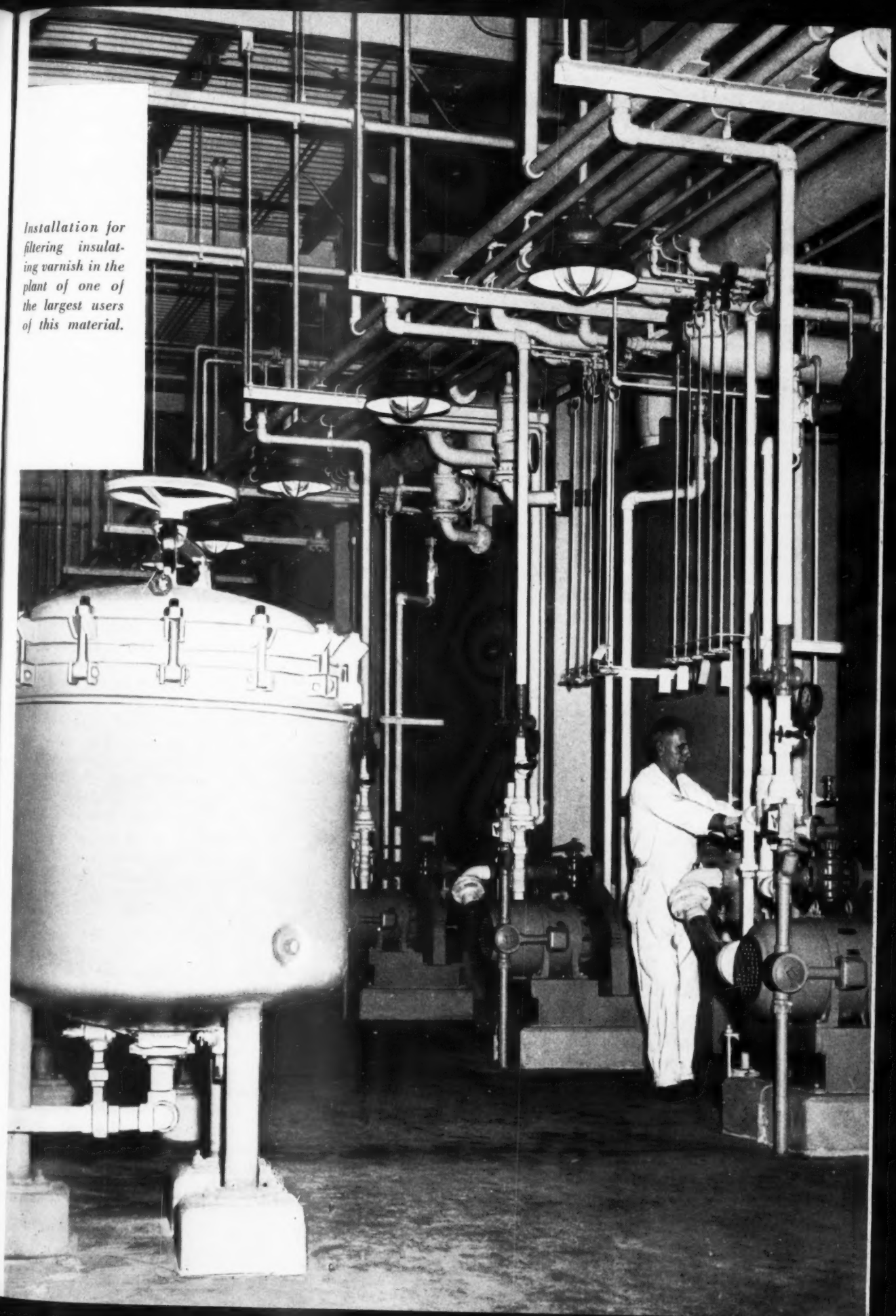
Theory of the filter aid

We can see from this that fundamentally the theory and use of filter aid is quite simple. The cellular, irregular particles of filter aid simply keep the jell-like particles in the varnishes separated as these particles are deposited on the filter paper, thereby keeping the filter area porous, and permitting the varnish to flow through much longer and at far less pressure. As these irregular shaped, cellular diatoms are dispersed in the liquid being filtered, the jell particles in the liquid become attached to them so that when the diatoms are trapped on the filter paper they also trap the jell particles. For this reason and the fact that the diatoms are porous themselves and thus permit liquid to actually pass through their structure, diatomaceous earth also acts as an efficient clarifying agent as well as an anti-clogging agent.

Basic facts on filtration of varnishes

To take full advantage of the benefits of these filter aids, however, some rather basic facts should be kept in mind, especially in the filtration of varnishes. Although these diatomite cells are quite strong structurally, it should be remembered that they can be broken down and compacted either through velocity or pressure, or a combination of both. Good filter practice indicates, therefore, that the velocity and pressure should be kept relatively low.

It is always a strong temptation for the filter operator at the beginning of a cycle, when the filter is clean, the pressure low, and the varnish flowing fully and brilliantly, to "give her the gun." This, however, frequently does not produce the maximum results or throughput. The reason being that if the mixture of filter aid and slim particles strike the filter bed with too high a velocity, it tends to impact them too lightly, resulting in decreased cake porosity and decreased ultimate throughput. Experience indi-



Installation for filtering insulating varnish in the plant of one of the largest users of this material.

cates that most varnishes are filtered to best advantage at a maximum rate of 40 to 50 gph per square foot. Of course, where it is a problem of merely removing coarse skins, scale particles, etc., this rate can be increased considerably.

Again, in filtering with diatomaceous filter aid, we can defeat our purpose quite easily with too much pressure because excessive pressure may break down the very filter aid cells that we have introduced to keep the filter bed porous. Here again it is quite a temptation for the operator to conclude that the remedy for a slowing up of flow rate is more and more pressure, whereas the remedy usually is more filter aid or occasionally a coarser filter aid.

Amount of filter aid

From the foregoing outline of the use of diatomaceous filter aid, it becomes obvious that the amount of filter aid that we use is of vital importance. If the porous diatoms are to keep the slim particles separated, there should naturally be enough diatoms to do the job or they'll get "snowed under." The proper amount for varnishes can vary by weight from 1/10 of 1% for a fairly clear and light bodied alkyd to 1% by weight for a very dirty natural gum varnish or gloss oil. Most varnishes are filtered very successfully with ¼ to ½ of 1% by weight of diatomaceous filter aid. The filtration engineer usually can work these formulas out for the particular product with but a few trial runs.

It is not sufficient, however, to merely have filter aid in adequate quantity. It is just as important that it be properly dispersed. Here, the fact that varnishes are usually made and filtered batchwise is advantageous because the best dispersion is always obtained — especially with a viscous liquid — by introducing the indicated amount of filter aid into the liquid and then thoroughly mixing it by means of mechanical agitation. Proper agitation is extremely important. Frequently it is not convenient, or it may even require a substantial expenditure, to rebuild a plant to obtain good agitation, but in the long run it is bound to pay out. This decision is, of course, nothing more or less than the familiar decision that management is called on to make so frequently today—namely to engineer the job right from the start and make the necessary plant investment once and for all, or to keep spending good dollars year in and year out on makeshift plant and methods.

Temperature considerations

In dealing with viscous liquid the temperature of the liquid and grade (for size) of the filter aid naturally are important factors. It would appear that, within limits, the higher the temperature and the coarser the filter aid the better. We find, however, that this theory is subject to some serious limitations. Even with present day scientifically controlled cookers and refined raw materials, we can still find many varnishes that contain jell particles and microscopic colloidal suspensions. If these varnishes are filtered at too high a temperature, say around 250° F., these fish eyes may be in solution, pass through the filter bed and coagulate, after filtering, as the temperature drops. If these elusive fish eyes are a source of trouble, filtering at a low temperature — around 150° F. — should be tried. Again, there are many hazy materials, particularly some synthetics that cannot be cleared up with the coarses grades of filter aid, and here a medium grade is indicated.

A varnish maker of many years experience recently told me of a quick and simple method of detecting these jell particles in filtered varnish samples. Since this is not always so easy to do, because these particles are transparent, it may be of value to mention it here. He fills a standard Gardner-Holt bubble tube with the varnish, then pours off about 2/3 of the contents, and when the remainder has cooled off, the tube is tilted and if jell particles are present they are visible on the walls of the tube.

Filtering "un-cooked" materials

Up to now we have considered the clear cooked materials only. Spirit varnishes, or cold cuts, shellacs and pigmented materials require altogether different handling.

Spirit varnishes usually contain such a large amount of solids and have to be filtered at such a low temperature due to the volatile thinners that an altogether different approach is indicated. These materials frequently are first settled, and then decanted off and filtered. As a rule, a very coarse filter aid and a filter with a large amount of area rather than cake space, such as a plate and frame, is preferred. The clarification of these materials naturally is always more troublesome and costly than it is with the cooked variety.

Shellacs, due to the coarse solids that usually are to be removed, are best filtered through a fairly porous filter paper, and without filter aid. Here, flow rates up to 75 to 100 gph per square foot can be obtained.

Centrifugal clarifiers

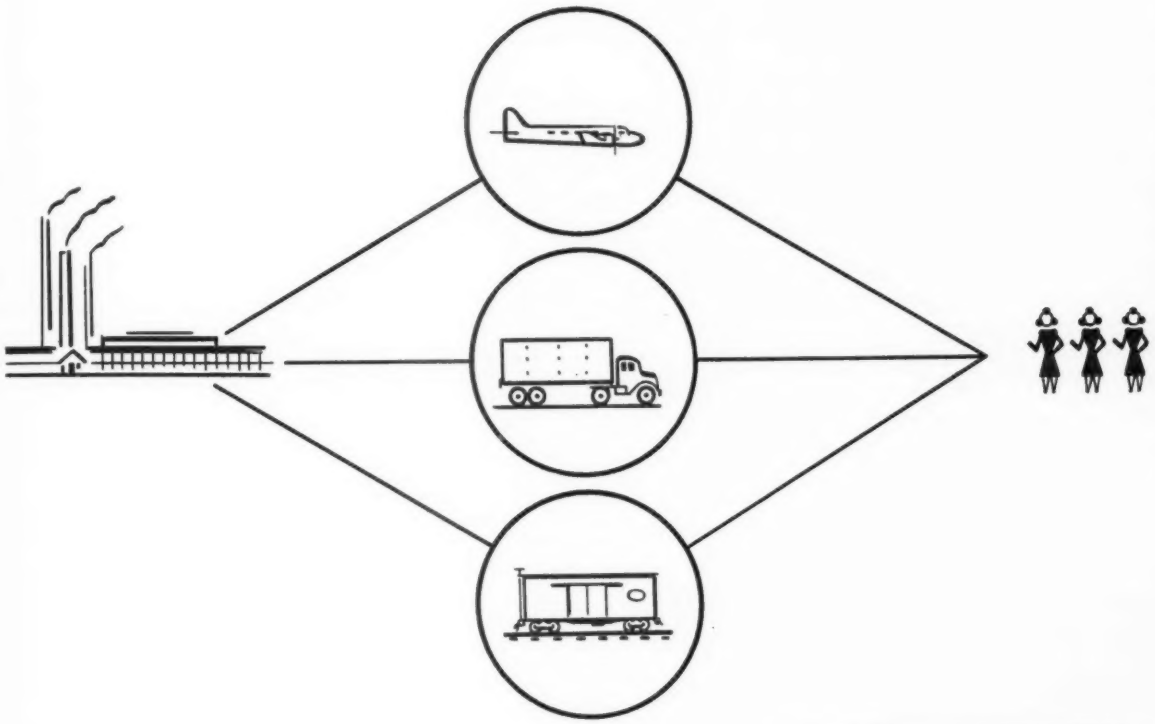
We have treated the whole subject of clarification so far from a standpoint of static filters rather than centrifugal clarifiers. To make this article complete we should mention both methods. With the centrifugal clarifier it is not necessary to use filter aid or a filter paper or filter cloth. In some cases a centrifugal may be cleaned more easily than some types of filters. A filter will usually do a finer and sharper clarification of the more difficult to clean products in which the solids often have the same specific gravity as the liquid being filtered.

Pressure straining

Considerable work has been done in connection with the pressure straining of pigmented enamels and paints. The big problem here is to decide on the proper filter or strainer media for the particular job to be done. Up to the present, this has frequently been a trial and elimination process. However, certain types of synthetic, very porous paper and certain grades of felt that can be washed and re-used have proved very successful. Tremendous production increases have been made over the old type bag strainer tied over the

to Page 73 →

Safe Transit...
a Must for Home Appliances



methods for

loading
bracing
blocking
unloading

PRE-TESTED
SAFE TRANSIT SHIPMENT

This PACKAGED PRODUCT meets the pre-testing standards established by the National Safe Transit Committee and will withstand ORDINARY transportation and handling hazards.

NATIONAL SAFE TRANSIT COMMITTEE

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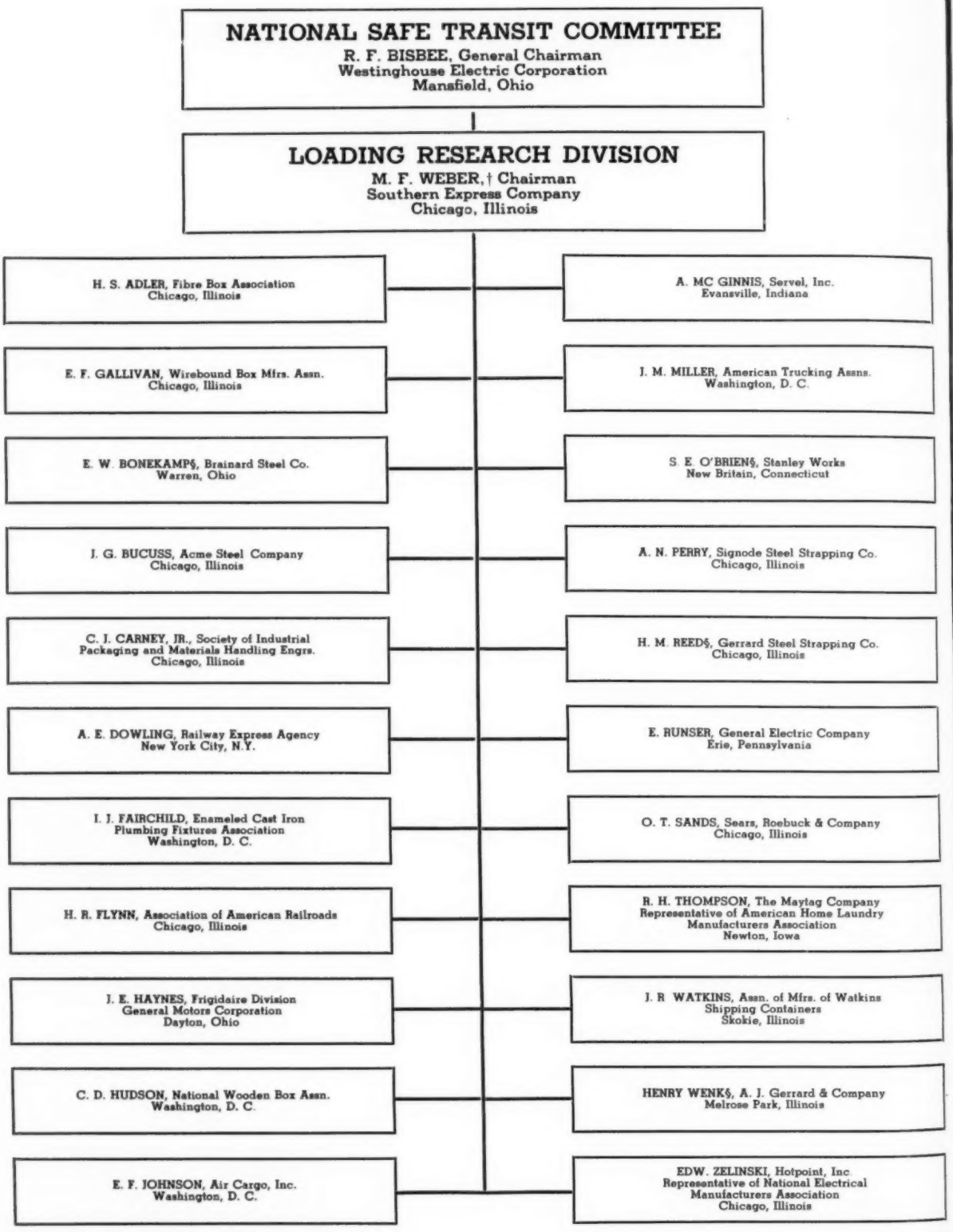
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Foreword

This material was prepared for the purpose of supplying shippers with readily understandable information on accepted SAFE TRANSIT procedures.

The suggested methods of loading, bracing, blocking, and unloading shipments of home appliances and related products described are those proven to be most satisfactory from the standpoint of SAFE TRANSIT. These methods are the results of the combined experience of shippers, receivers, carriers, the steel strapping industry, and other interested groups.

The described methods are not mandatory insofar as the carriers are concerned, but they are the definite recommendations of this Committee.

Individual shippers may find it advisable to modify or combine one or more of the illustrated methods in order to meet some particular problem.

None of the loading, bracing, or blocking procedures supersede or alter any of the regulations set forth in the Association of American Railroads' published pamphlets or circulars.

Loading Research Division
National Safe Transit Committee

Selection and preparation of railway car equipment

ORDER and select clean cars having sound roofs and smooth and sound floors, sidewalls and endwalls. Cars failing to meet these requirements should be rejected by the shipper.

Endeavor to secure cars of such inside width which will allow the minimum space between lading and the car sidewalls.

Order cars of adequate inside height to permit the loading of a sufficient number of layers of containers to make minimum carload weight.

All obstructions, such as wood cleats nailed to car end or sidewalls and floors, should be removed. Protruding nails, staples, or other metal fastenings should also be removed from the car floor, end or sidewalls. (Do not remove any permanent car fittings or attachments.) Cars should be swept clean before loading.

Proper stowing of lading in cars

Lay out definite stowage plans for all products, and supply your car-loading personnel with these plans.

All lading must be tightly stowed lengthwise and crosswise of cars. This will eliminate accumulation of slack space within loads, which is frequently a direct cause of serious damage to the lading.

Lading should be stowed so that loads finish off with a flush surface, or face, at the doorway areas of cars. Any irregularity developing in the face of a load, due to different container sizes, should be filled in with adequate blocking material or fillers. This affords complete contact or bearing of gates or bulkheads across the entire width and heights of a load without undue pressure, or force, being applied against any of the containers immediately adjacent to the gate, or bulkhead.

On floating and anchored loads braced with steel strapping, or on wood braced loads, divide free space between lading and car sidewalls equally.

STATEMENT OF POLICY

The Loading Research Division of the National Safe Transit Committee is simply saying to shippers:

"If you will follow these recommendations, experience has shown that your loss and damage will be acceptable minimums. It is up to each shipper to decide whether or not he will use these methods. The program is entirely voluntary and implies no connection with tariffs, freight rates, claim procedures or any other existing transit regulations."

NATIONAL SAFE TRANSIT COMMITTEE
1010 Vermont Ave., N.W., Washington 5, D. C.

Proper construction and use of wood gates or bulkheads

ALL wood gates or bulkheads should be constructed of sound lumber, preferably of Group II, Group III or Group IV woods.

If Group I woods are employed, use the next larger commercial size. The selection of the size of lumber to be used should be based on the weight, size, and nature of the product to be braced.

Gates or bulkheads must be well nailed, their members spaced so as to confine all containers and bear against the portions of the containers having the greatest strength. Gates or bulkheads should extend the full width and height of loads, but should not over extend more than ½" in any direction.

Gates or bulkheads constructed of 1" lumber are usually adequate for floating loads braced with steel strapping, or for anchored loads braced with strapping where truss-type construction is employed, or where horizontal wall anchored strapping is supplemented with vertical diagonally anchored strapping. When the truss-type of construction is not employed and when horizontal wall anchored strapping alone is used, lumber of greater thickness is desirable. (Study the accompanying illustrations to see which most nearly meet with your loading requirements.)

On rigid wood braced loads, closely follow the instructions in drawings Nos. 11, 12, 13, 17, 18, and 20 as to dimensions and placement of all bracing members.

Table of Woods

Species of Wood Most Commonly Used for Bracing

Group I Soft Woods	Group II and III Medium Woods	Group IV Hard Woods
Cedar	Douglas Fir	Ash
Chestnut	Hemlock	Beech
Cottonwood	Maple	Elm
Fir, Alpine	Larch	Hickory
Fir, Balsam	Pine, No. Carolina	Maple, Hard
Fir, White	Pine, So. Yellow	Oak
Pine, Jack	Ash	
Pine, Ponderosa	Elm	
Pine, White		
Spruce		
Poplar		

Floating loads braced with steel strapping

STEEL strapping is draped in car, and end gates placed in position before stowing of the lading begins. The strapping is stapled or otherwise secured to the end gates to insure its remaining in proper position on the gates. The strapping must be positioned on those gates or bulk-members bearing against the strong portions of the containers making up the load, so that equal distribution of pressure against the load is afforded.

All lading must be tightly stowed lengthwise and crosswise of cars.

Suitable lumber should be used as protection between containers of unequal height and width.

After completion of the stowage of the lading, the doorway or front gates are positioned, and the strapping properly tensioned and sealed. The strapping is then stapled or otherwise secured to the gates to retain it in proper position. Where two or more ties of strapping are used on a load, it is preferable that these ties be tensioned simultaneously.

When a total of 18" or more of free space exists between the lading and car sidewalls (9" or more on either side of the load), suitable wood guide strips nailed to the car floor should be used. Even though a total of 18" or more space between lading and car sidewalls does not exist, the use of guide strips on car floors is desirable to retain rows of containers in proper longitudinal alignment. These guide strips should extend, continuously, the entire length of the car.

Side shift of containers, other than corrugated or fiber, in other than the floor layer of loads can be eliminated by the use of cross-ties of punched steel strapping as described in drawing No. 3.

When possible, it is desirable to leave space between loads or units and car endwalls so as to permit free movement of the lading in both longitudinal directions.

For proper type of strapping equipment, strapping size, and accessory items, consult your suppliers.

Note: References to steel strapping include both flat and round types.

Anchored load of ranges illustrating truss type gate construction. See drawing VI, page 35. Suitable for a wide variety of applications.

Drawings III, IV, VI, IX and X (pages 34, 35 and 36) represent good basic bracing methods suitable for a wide variety of packaged products.

Anchored loads braced with steel strapping

FLAT steel strapping must be properly threaded and wrapped around anchor plates. See drawing No. 1. For application of round steel strapping see drawing No. 2.

Nail anchor plates to car sidewalls or floors, at predetermined points, a minimum of 3′ behind the face of the load. Anchor plates nailed to car sidewalls should be positioned so that all nails engage car wall posts. On ladings of great density, anchor plates should be staggered on alternate posts in car sidewalls or on alternate boards in car floors to avoid undue stress at any one point in the car. Drape car with strapping before stowage of the lading begins.

Steel strapping ties should be positioned so that they engage those members of the gates or bulkheads bearing against the strong portions of the containers making up the load, and so that equal distribution of pressure against the load is afforded. Stow lading tightly lengthwise and crosswise of the car.

In single sheathed cars, anchor plates should be nailed to sound car wood sidewall members.

To insure adequate strength of the bracing at the middle of the face of the load, use either a truss type gate construction with horizontal anchored strapping, or supplement the horizontal anchored strapping with vertical diagonally anchored strapping.

When a total of 18″ or more of free space exists between the lading and car sidewalls (9″ or more on either side of the load), suitable wood guide strips nailed to the car floor should be used.

When the stowage of the lading is completed, the gates or bulkheads are positioned, and the steel strapping ties properly tensioned and sealed. The strapping is stapled or otherwise secured to gates to retain it in proper position.

When two or more ties of strapping are used, they should be tensioned simultaneously so as to bring the load back uniformly into position.

For proper type of strapping equipment, strapping size, and accessory items, consult your supplier.

Loads braced with rigid blocking

ALL lading should be stowed tight lengthwise and crosswise of cars.

Properly seasoned lumber should be used for bracing and blocking. Green lumber should not be used as it does not have the strength or rigidity of seasoned lumber.

Loads which do not extend into car doorway areas must be securely braced as indicated in drawing Nos. 11, 12, 13, 17, 18 and 20. Lengthwise wood spreaders between bulkheads should be at least 1″ longer than space between bulkhead uprights so as to afford a driving fit.

Secure nailing is especially important. Use an ample number of nails and of such size as to permit proper penetration. All nails must be driven straight and fully into bracing.

Loading and unloading

CAREFUL handling of all products in trucking, loading and unloading is of prime importance.

The correct use of mechanical handling equipment in loading and unloading home appliances has been found to be very effective in reducing product damage attributable to improper manual handling.

Do not "walk" containers in loading or unloading.

Do not delegate only one man to unload containers from second or subsequent layers of loads. Sufficient help should always be provided to prevent undue shocks when containers are brought to rest on floors. In the event mechanical handling equipment is unavailable, an unloading skid should be used.

Where lift trucks are used for loading and unloading, steel floor plates should be used in car to prevent damage to car floor.

PLACARDING

Shippers who have received certificates under the National Safe Transit Program are eligible to use the N.S.T. car placards. These placards should be applied to placards boards on the exterior of each car side.

Placards must be obtained from the National Safe Transit Committee, 1010 Vermont Avenue, N. W., Washington 5, D. C.

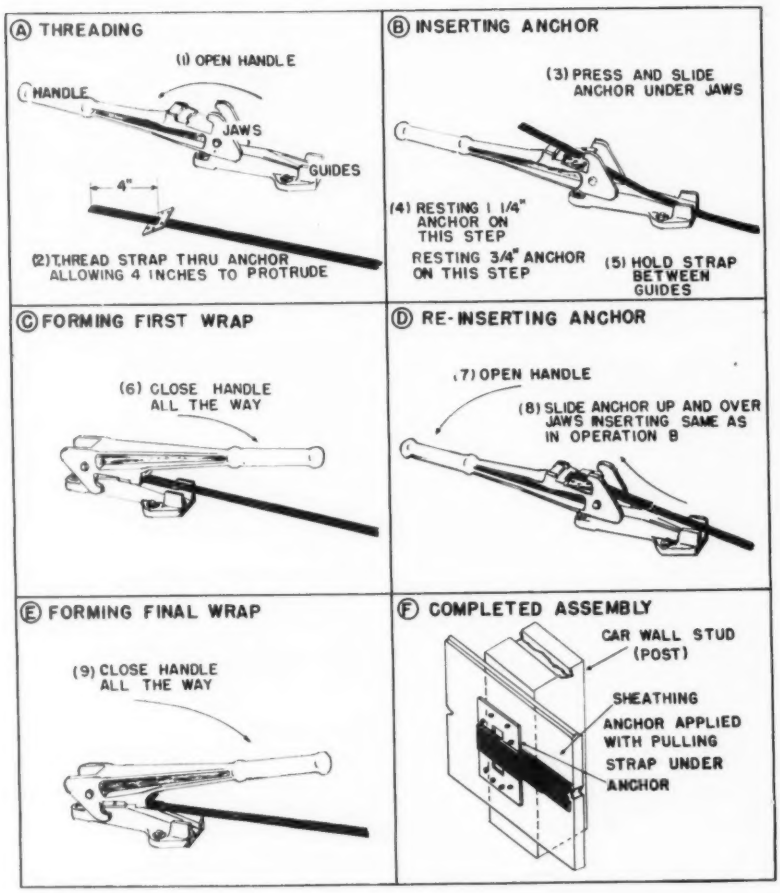
ANCHORING METHODS FOR ROUND AND FLAT STEEL STRAPPING

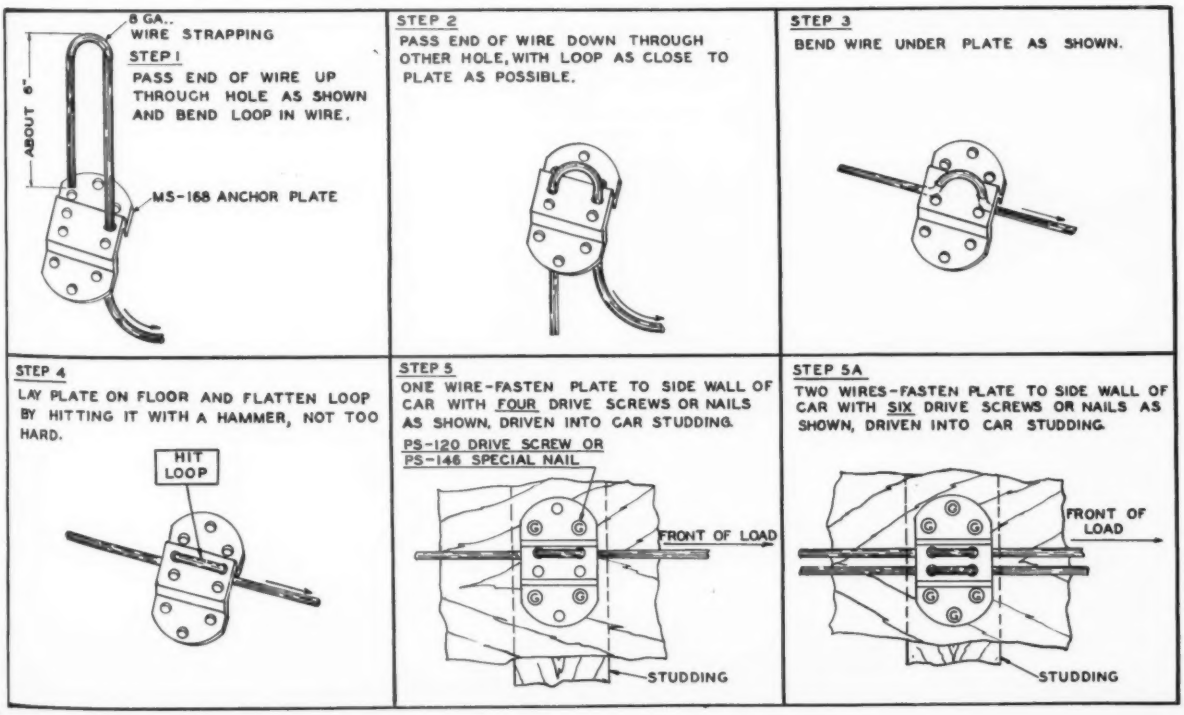
I

Right: Progressive steps in the use of an anchor threader, for the application of flat steel strapping.

II

Below: Demonstration of the proper use of round steel strapping.


Ⓐ THREADING
(1) OPEN HANDLE
HANDLE
JAWS
GUIDES
4"
(2) THREAD STRAP THRU ANCHOR ALLOWING 4 INCHES TO PROTRUDE
Ⓑ INSERTING ANCHOR
(3) PRESS AND SLIDE ANCHOR UNDER JAWS
(4) RESTING 1 1/4" ANCHOR ON THIS STEP
RESTING 3/4" ANCHOR ON THIS STEP
(5) HOLD STRAP BETWEEN GUIDES
Ⓒ FORMING FIRST WRAP
(6) CLOSE HANDLE ALL THE WAY
Ⓓ RE-INSERTING ANCHOR
(7) OPEN HANDLE
(8) SLIDE ANCHOR UP AND OVER JAWS INSERTING SAME AS IN OPERATION B
Ⓔ FORMING FINAL WRAP
(9) CLOSE HANDLE ALL THE WAY
Ⓕ COMPLETED ASSEMBLY
CAR WALL STUD (POST)
SHEATHING
ANCHOR APPLIED WITH PULLING STRAP UNDER ANCHOR


8 GA.. WIRE STRAPPING
STEP 1
PASS END OF WIRE UP THROUGH HOLE AS SHOWN AND BEND LOOP IN WIRE.
ABOUT 6"
MS-168 ANCHOR PLATE
STEP 2
PASS END OF WIRE DOWN THROUGH OTHER HOLE, WITH LOOP AS CLOSE TO PLATE AS POSSIBLE.
STEP 3
BEND WIRE UNDER PLATE AS SHOWN.
STEP 4
LAY PLATE ON FLOOR AND FLATTEN LOOP BY HITTING IT WITH A HAMMER, NOT TOO HARD.
HIT LOOP
STEP 5
ONE WIRE-FASTEN PLATE TO SIDE WALL OF CAR WITH FOUR DRIVE SCREWS OR NAILS AS SHOWN, DRIVEN INTO CAR STUDDING.
PS-120 DRIVE SCREW OR PS-146 SPECIAL NAIL
FRONT OF LOAD
STUDDING
STEP 5A
TWO WIRES-FASTEN PLATE TO SIDE WALL OF CAR WITH SIX DRIVE SCREWS OR NAILS AS SHOWN, DRIVEN INTO CAR STUDDING.
FRONT OF LOAD
STUDDING

Carloading methods . . . . (Part 1, Section 1)

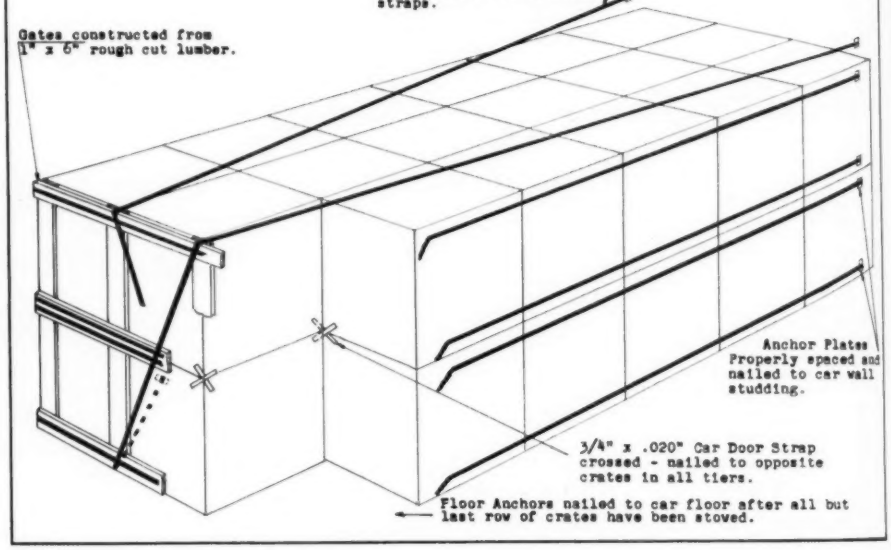
illustrating loading methods for stoves, ranges, home freezers, washing machines, kitchen cabinets, bathtubs (loaded flat) and sinks (loaded flat)

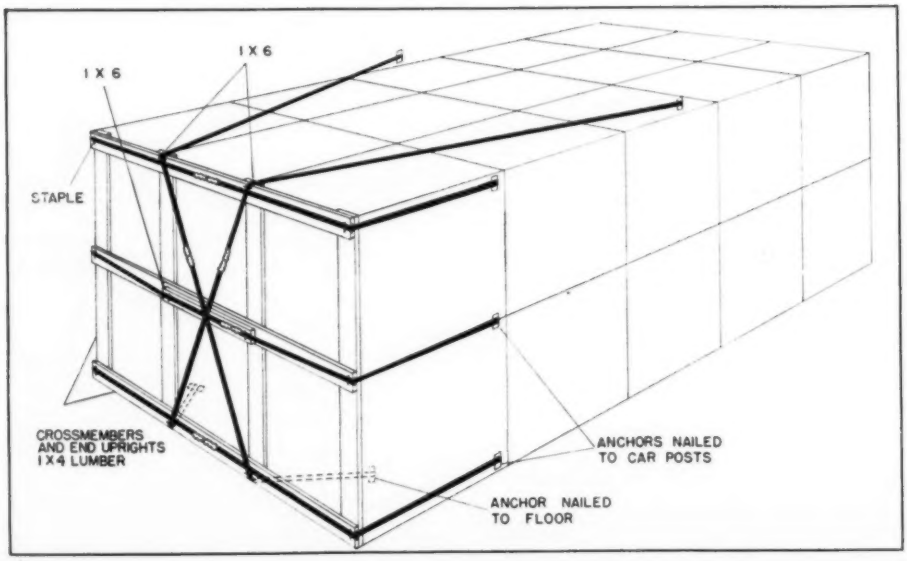
Editor's Note: Thirteen drawings and numerous photographs are used in Part I, Section 1, to show loading and bracing methods for the products listed. Part II, Sections 2, 3, 4, 5 and 6, will appear in May *finish*. Section 2 will show carloading methods for refrigerators; Section 3 for water heaters, bathtubs (on end), sinks (on end), and other high loads; Section 4 for small appliances in cartons, crates and boxes; Section 5 for special loads and stop-over loads; and Section 6 for materials handling of products listed.

FLOOR-WALL ANCHOR LOADS

III

The center of the gate is reinforced by the use of vertical diagonal strapping nailed to the floor and the walls. This retains the center of the load and relieves the stresses at the edges of the gate.


Straps from Anchor Plates about 6" above top of load cross in front of gate and are sealed to floor anchor straps.
Gates constructed from 1" x 6" rough cut lumber.
Anchor Plates Properly spaced and nailed to car wall studding.
3/4" x .020" Car Door Strap crossed - nailed to opposite crates in all tiers.
Floor Anchors nailed to car floor after all but last row of crates have been stowed.



FLOOR-WALL ANCHOR LOADS

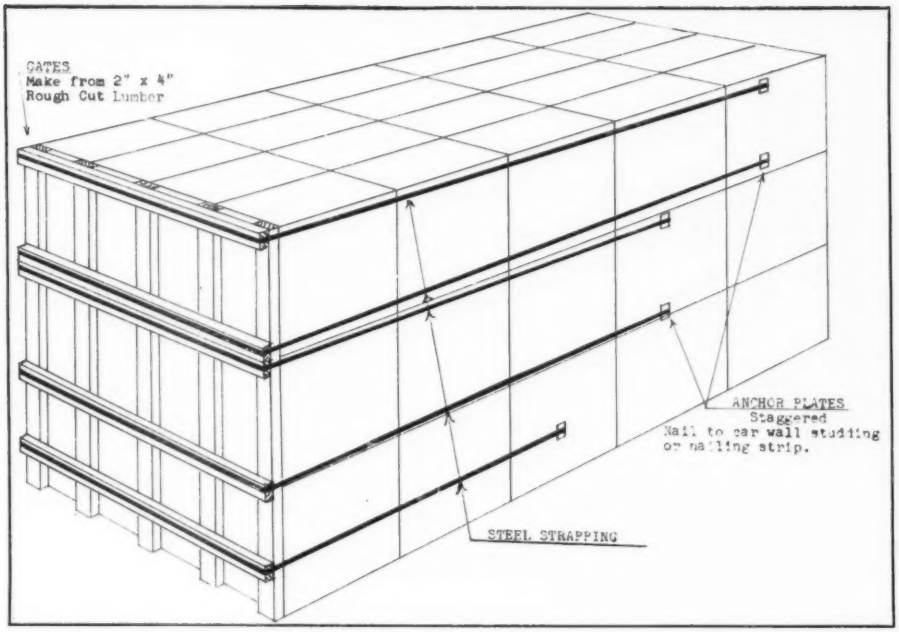
IV

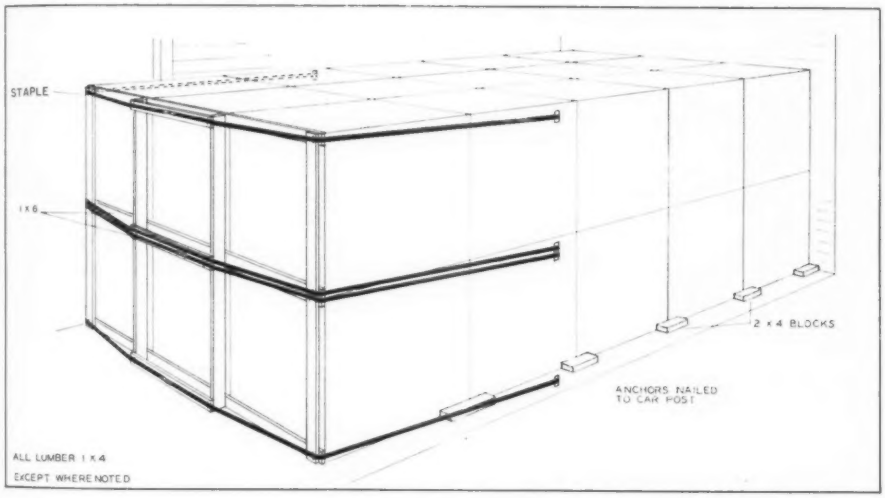
This illustration shows the use of fewer and heavier straps. It also demonstrates the use of a truss block.

WALL-ANCHOR LOAD

V

Anchors are secured to alternate car wall studding. The long top straps absorb the greatest amount of shock which is created by "whip" action of the top layer. The vertical gate members contact the containers at the strong point at intersections of stack, and the heavier gate construction eliminates the necessity of "floor-to-wall" anchor straps.





WALL-ANCHOR LOAD

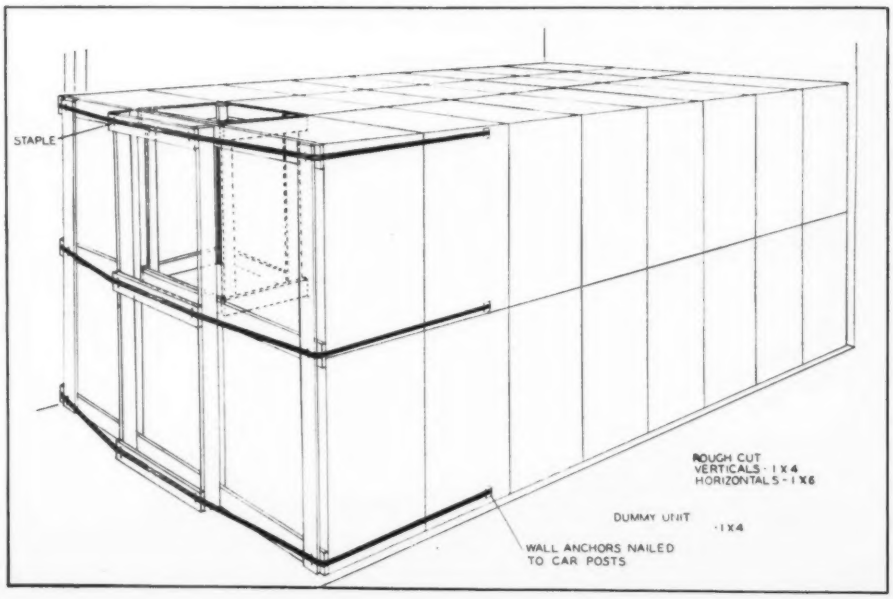
VI

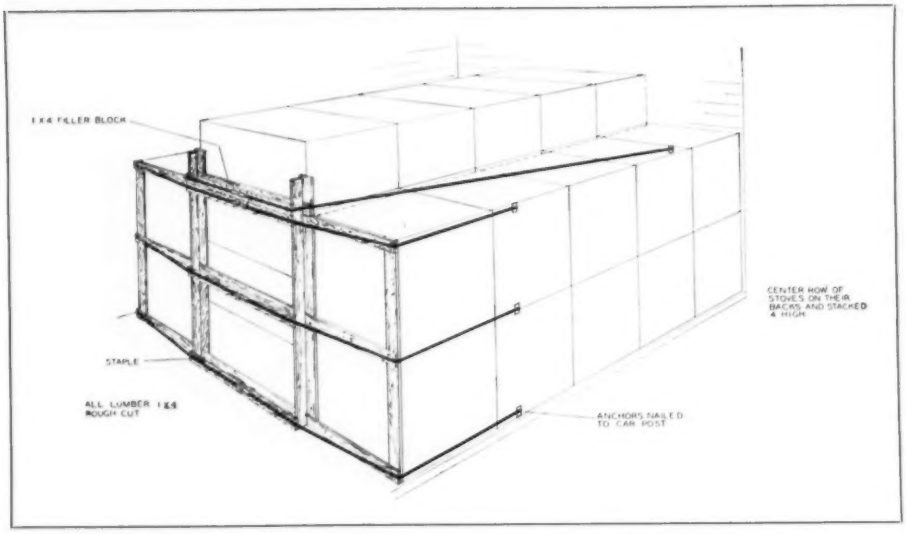
This illustration shows the application of truss type gate. When the lading does not fill the width of the car, 2"x4" blocks are nailed to the car floor at each side of the lading to serve as guide strips. The stoves in the second layer are held in position by an "X" tie of punched strapping as shown in illustration No. III.

WALL-ANCHOR LOAD

VII

An application of a wall anchor load showing a filler brace or "dummy unit" to take up space in the incomplete top layer. (An empty crate may be used as the "dummy unit".)




1 x 4 FILLER BLOCK
CENTER ROW OF STOVES ON THEIR BACKS AND STACKED 4 HIGH
STAPLE
ALL LUMBER 1 X 4 ROUGH CUT
ANCHORS NAILED TO CAR POST

WALL-ANCHOR LOAD

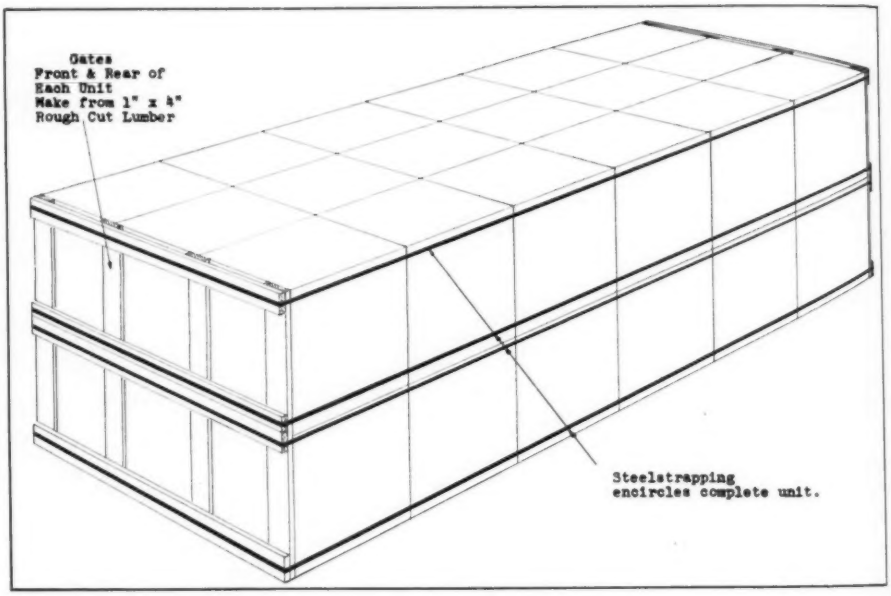
VIII

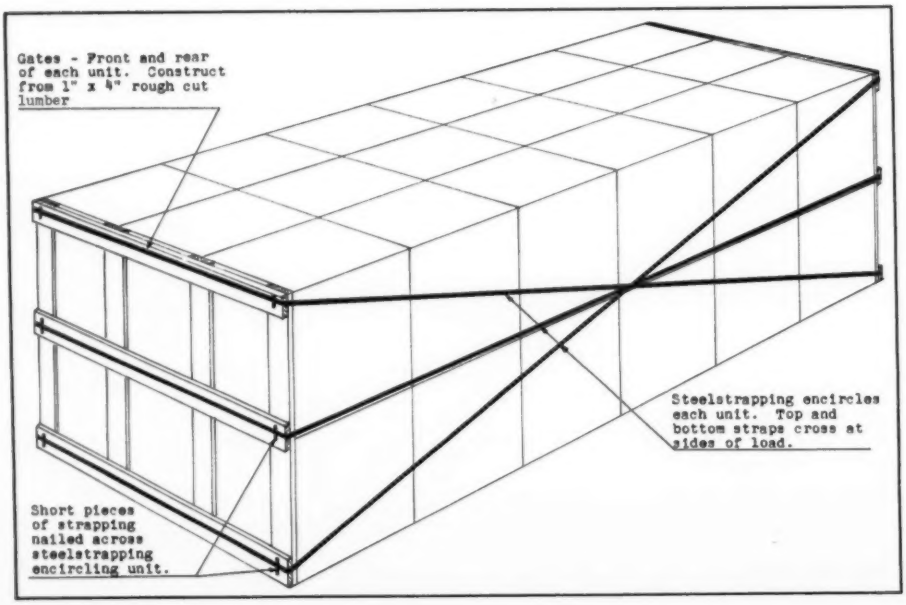
When minimum carload weight cannot be gained through conventional vertical loading, capacity may be secured by placing the center row of units on their backs and stacking them four high. Caution: Package and product must be so designed that loading on back is permissible.

FLOATING LOAD

IX

The floating load permits each half car unit to shift slightly during transit. Shocks are dissipated by friction between lading and car floor. The gates, front and rear of each half-car unit, may be constructed of minimum size material. Four encircling bands, two of which are near the layer intersection, bind the half-car load into one complete unit.




Gates - Front and rear of each unit. Construct from 1" x 4" rough cut lumber
Steelstrapping encircles each unit. Top and bottom straps cross at sides of load.
Short pieces of strapping nailed across steelstrapping encircling unit.

FLOATING LOAD

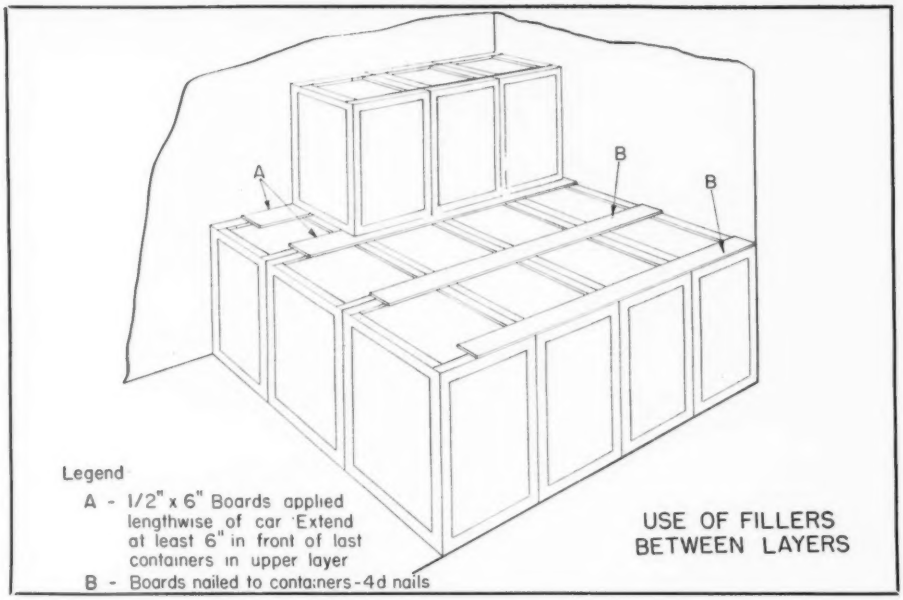
X

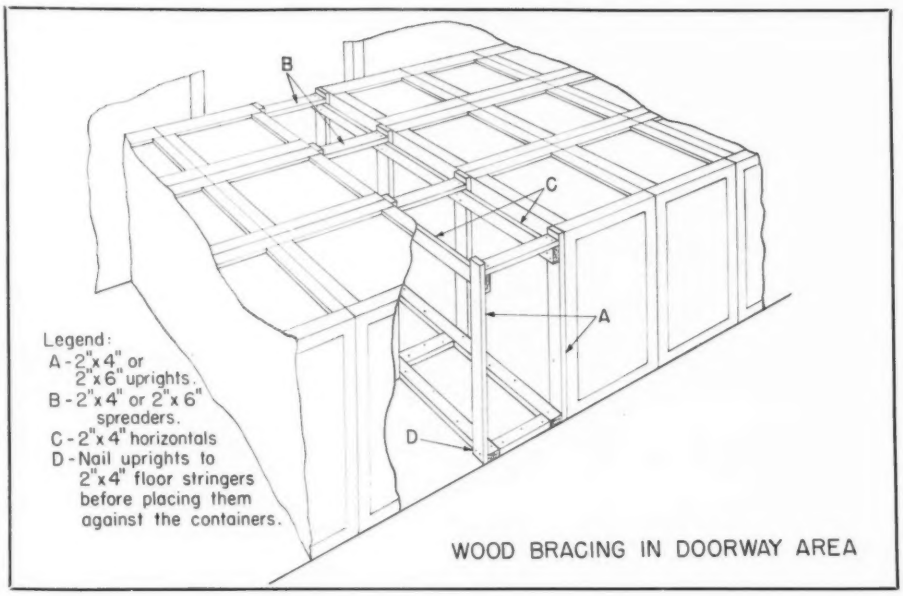
This example of a floating load shows the application of diagonal ties around the complete unit to prevent tilting of the complete half-car unit.

FILLERS

XI

This illustration shows use of fillers between layers.


A
B
B
Legend
A - 1/2" x 6" Boards applied lengthwise of car Extend at least 6" in front of last containers in upper layer
B - Boards nailed to containers - 4d nails
USE OF FILLERS BETWEEN LAYERS


B
C
A
D
Legend:
A - 2"x4" or 2"x6" uprights.
B - 2"x4" or 2"x6" spreaders.
C - 2"x4" horizontals
D - Nail uprights to 2"x4" floor stringers before placing them against the containers.
WOOD BRACING IN DOORWAY AREA

BRACING

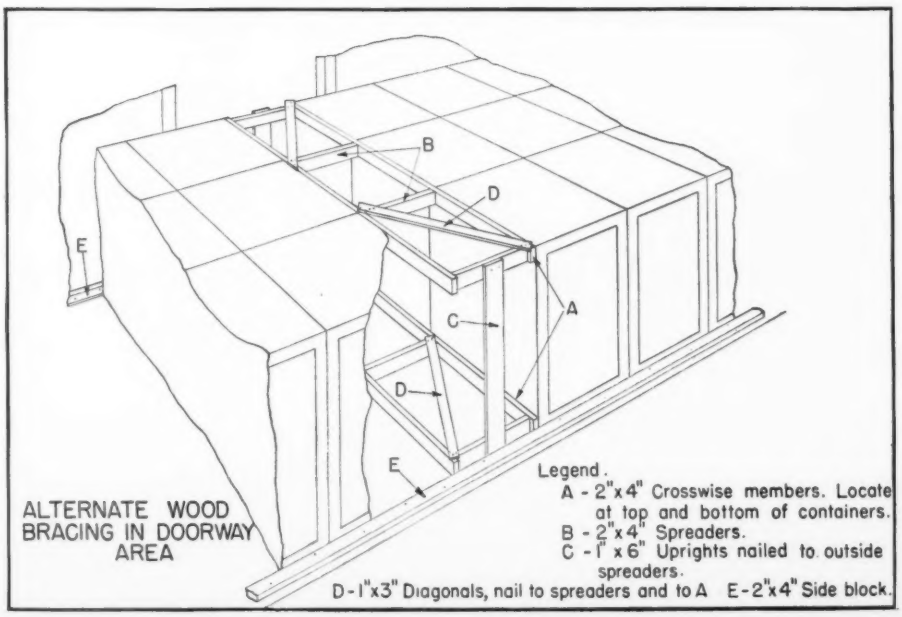
XII

Method of wood bracing in a doorway area.

BRACING

XIII

Alternate method of wood bracing in doorway area.

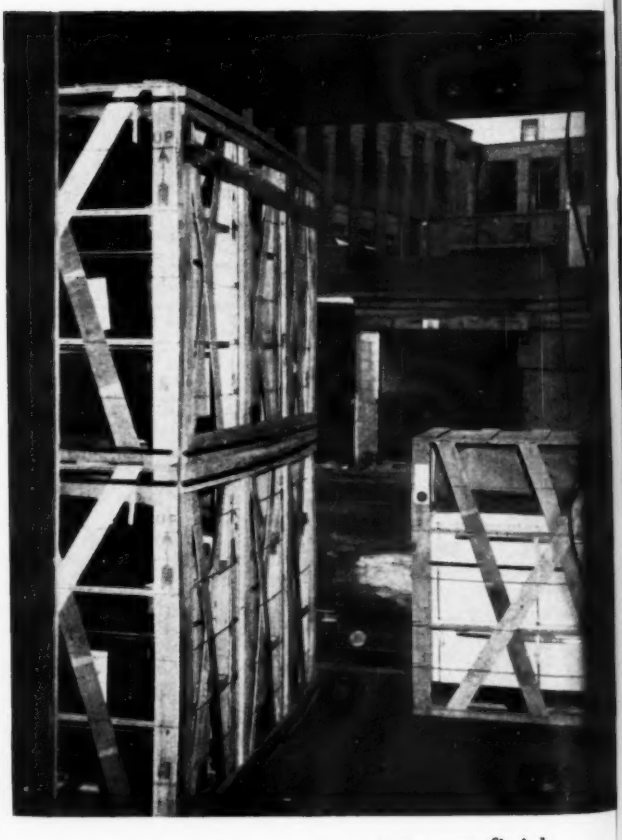

B
D
E
A
C
D
E
ALTERNATE WOOD BRACING IN DOORWAY AREA
Legend.
A - 2"x4" Crosswise members. Locate at top and bottom of containers.
B - 2"x4" Spreaders.
C - 1" x 6" Uprights nailed to outside spreaders.
D - 1"x3" Diagonals, nail to spreaders and to A E - 2"x4" Side block.

THESE PHOTOS SHOW SOME PRA
OF METHODS REPRESENTED BY F

Floating load of automatic washing machines. See drawing IX.

Floating load of space heaters. Similar to drawing IX except three instead of two layers.

Photo demonstrates floating load of ranges all stowed vertically. See drawing IX.

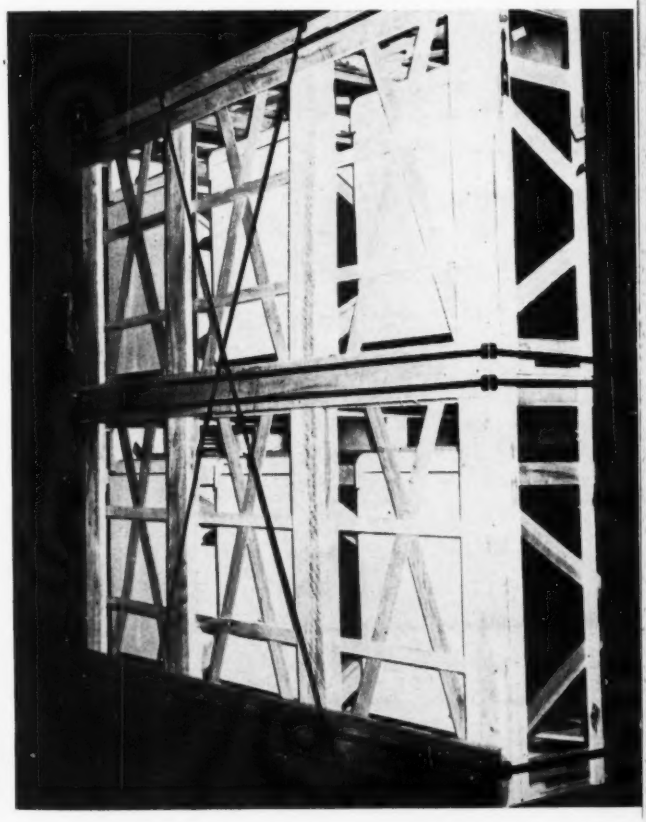


PRACTICAL APPLICATIONS BY PRECEDING DRAWINGS

Floating load of washing machines. See drawing IX.

Photo demonstrates anchored load of ranges showing middle row stowed on backs. See drawing VIII.

Photo shows one end of loaded car representing an anchored load of ranges. See drawing III.



Pressed Metal Institute sponsors technical symposium

technical and management personnel of metal stamping companies discuss testing and prejudging metals — and — cold forming and extrusion of steel

AT a two-day session at Hotel Carter, Cleveland, Ohio, March 16 and 17, technical and management personnel of metal stamping companies discussed "testing and prejudging metals" and "cold forming and extrusion of steel." The technical symposium was sponsored by the Pressed Metal Institute, the metal stamping industry's national association.

Wallace Ardussi, chairman of the PMI Cleveland District and president of Variety Machine & Stamping Co., presided at the first day's session on testing and prejudging metals.

Subjects discussed on the first day of the meeting included:

"Prejudging of Sheet and Strip Low Carbon Steels," by E. F. Lundeen, metallurgical engineer, sheet and strip, Inland Steel Company; "Testing and Prejudging of Aluminum Sheet and Strip," by E. V. Sharpnack, technical service engineer, Reynolds Metals Co.; "Prejudging Applications of High Tensile Steels." by Clarence Altenburger, research engineer, Great Lakes Steel Co.; "Evaluation of Variations in Stainless Steels," by Robert H. Henke, development metallurgist, Allegheny Ludlum Steel Corp.; and "Testing Techniques and Equipment," by Sam Epstein, research engineer, Bethlehem Steel Co.

At the end of the first day's session, a question and answer period was held at which time the speakers answered questions which developed during the all-day session.

Cold extrusion gets the spotlight

Orrin B. Werntz, managing director of the Institute, presided at the morning session of the second day's program on cold forming and extrusion of steel.

At the morning session the following subjects were discussed:

"Military Interest in Cold Extrusion of Steel," by Col. Merle H. Davis, chief, Industrial Division, OCO *(see page 47)*; "History and Experimental Phases of Cold Forming of Steel," by J. Parker Bowden, engineer, Heintz Manufacturing Co.; "Steel Drawing Production Operations Aided by Application of Advanced Lubricant Technique," by F. Jerome Whitney, Jr., engineer, Heintz Manufacturing Co.

At a luncheon, presided over by Woodard G. Jeschke, Institute president and president of Res Manufacturing Co., Col. Horace F. Sykes, chief of Office of Production Planning, Munitions Board, discussed "Industrial Mobilization in Event of War." *to Page 66* →

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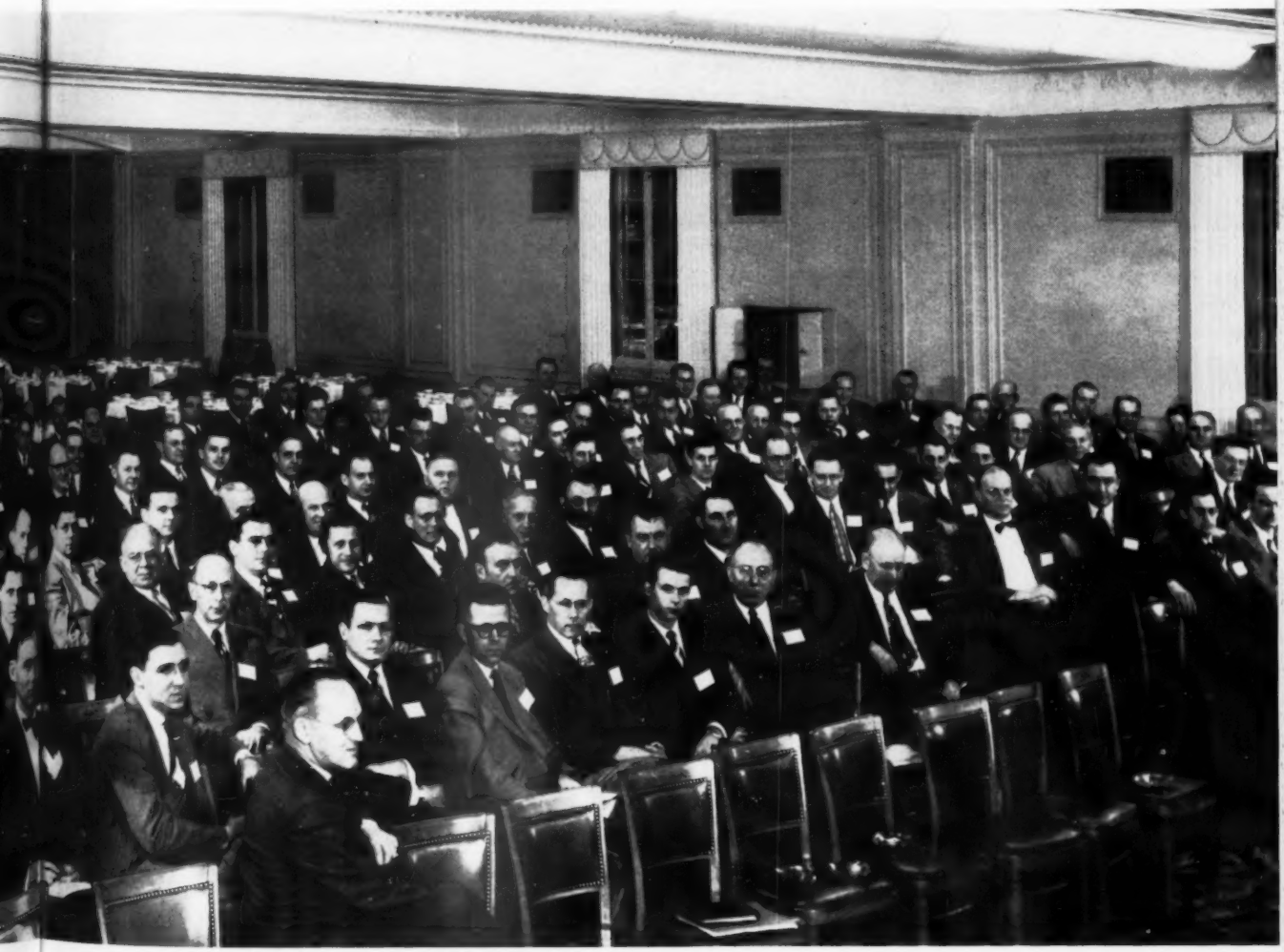
Photo shows the men who were at the speaker's table at the luncheon held on the second day of the meeting. Front row, left to right: Woodard G. Jeschke, PMI president, Res Mfg. Co.; Harry Blythe, Munitions Board; Orrin B. Werntz, PMI managing director; Col. Horace F. Sykes, Munitions Board, guest speaker; Wm. E. Miller, Bossert Company; and Howard Wolf, PMI vice president, Mullins Mfg. Corp. Back row, left to right: Albert Clements, Clearing Machine Corp.; H. J. McVey, Parker Rust Proof Co.; F. Jerome Whitney, Jr., Heintz Mfg. Co.; Weber DeVore, Heintz; Oliver F. Fancey, Washington PMI representative; E. V. Crane, Hydraulic Press Mfg. Co.; and J. Parker Bowden, Heintz. Photo below shows the group attending the session on cold forming and extrusion of metal.



Precision porcelain

the Otis Elevator Company experiments successfully with a porcelain enamel Escalator step riser

by R. A. Weaver, Jr. • PRESIDENT, BETTINGER ENAMEL CORP., WALTHAM, MASS.

Exclusive feature finish

In June, 1946, the sales department of the Escalator Division of Otis Elevator Company decided they wanted the risers on their Escalators black so they wouldn't show scuff marks from black soles, etc., and have them very highly scuff-resistant. They wanted a black, abrasive-resistant permanent finish without too much gloss. The logical thought was matte finish porcelain enamel, but subsequent investigation made it look as though the problems involved in producing a porcelain enamel riser to the close tolerance required was virtually impossible, especially as the piece was to be a structural part of the complete unit.

It must be remembered that the steps on an Escalator are very exacting pieces. The design of the steps centers around the riser, and, therefore, any new thoughts on risers had to conform almost exactly to the stainless steel design that was in use at that time. The design, of course, was not originally intended for porcelain which made the problem more difficult. Otis engineers went to work on the problem and adapted a new riser that conformed to the limitations of the over-all step and tried to hit on something that could be enameled.

Some of the largest enamelers in the country and several engineers who have had experience with porcelain enamel advised Otis that the job just could not be done and be held to the tolerances required. The Otis organization fortunately persevered to the point where they are now able to say that they proved to the industry that this job could be done.

The problem of close tolerances

Bettinger was willing to take the chance, and Fred Shaw (vice president and general manager), our superintendent, and engineering department spent many hours trying to work out exacting methods to produce a job of this close tolerance that actually had to be a structural part of the step and, at the same time, one that was economically possible.

The 33½° radius allows no tolerance and the radius in relation to plane (large flange of piece) must be exact. Enamel surface tolerance (which is carefully checked and inspected) must be in two coats between .060″ and .070″. As the fit of any riser in the assembly is an extremely important factor of safety, Otis justifiably insists on the closest (almost impossible) tolerance. Maintenance of this close tolerance and close inspection speaks very highly for the adaptability of porcelain enamel to close tolerance work.

These tolerances had to be maintained exactly because the movement of the riser was such, in connection with the step below, that the radius had to be absolutely perfect on every part of every piece, as the steps moved into a plane at the top and bottom of the Escalator. It was essential that practically no gap between one step and another could occur as the step swung on the radius in operation. Such problems as ladies coats and hose in toeless shoes getting caught and things of that nature made this an extremely important factor.

Tooling for the job

There seemed to be no question but what the accuracy of the job re-

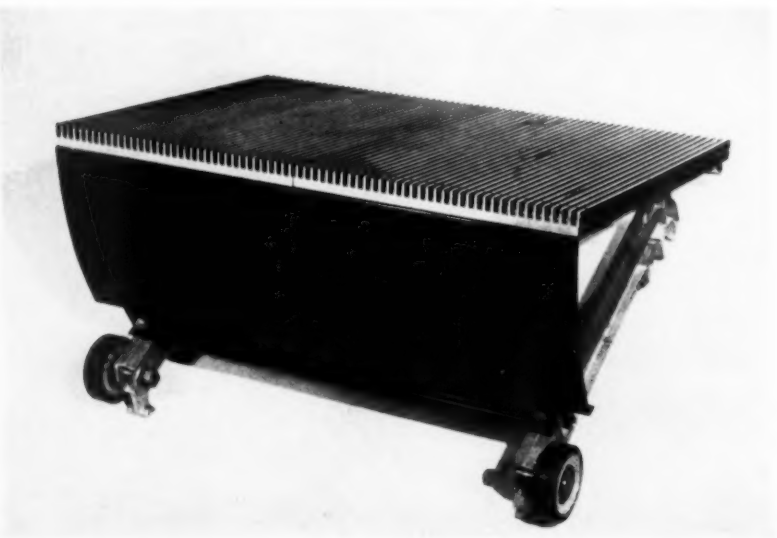


Photo shows a disassembled riser and step. The porcelain enameled riser is highly scuff-resistant.

Escalator utilizing porcelain riser is shown as installed in Byron's Department Store, Miami, Florida.

quired elaborate metal fabrication and tooling. Many discussions and much studying of the fabricating problem linked us with the Johnson-Claflin Corporation, Marlboro, Massachusetts, who are old New England craftsmen when it comes to die making and tolerance press work. Tolerances were actually so close that there was serious question as to whether they could be met before enameling, let alone after enameling. In other words, the normal mill rolling variations in thickness of metal, etc., would make differences in the radius of the piece. Slight variations in analysis of hardness of steel would make springback, etc., a factor in production which normally could not be controlled. This meant even more elaborate calculations, as far as tooling, so that minute adjustments could be made while the risers were being run in the press to try to offset these variables.

With this much difficulty in the fabricating alone, Fred Shaw pored over many of his old M.I.T. text books and files that he had accumulated over the years in regard to building tools for burning, to try to come up with some sure way to fire the piece so that the radius would be perfect.

Hairline accuracy gauges were made up in cooperation with Frederick Stolting of the Otis Harrison (N.J.) Works so that each piece could be carefully inspected and checked after the firing, but the job was set up in inspection to a point where the actual firing was an extreme obstacle. It was found that the construction of the piece was such that it could not be hung, even though normal commercial standards of enameling would have considered it ideal for hanging. Slight variations occurred because of the fact that no exacting support to the piece could be given to hold it in shape within the tolerances.

Elaborate burning tools were then developed which actually locked the piece in place over extremely close tolerance burning forms. Experience made adjustments of the forms necessary so that extra pressure in certain spots would force the piece to form itself further to the exact shape of the form in the firing. In other words, the piece was slightly "over bent" in the metal fabrication and forced just enough on the form so that the natural distortion in firing in the furnace brought it neatly into position on the form which was locked into place and yet allowed normal flexing in the heat.

Thousands run less than 1% rejection

There were many nervous moments when the first run was set up and a multitude of adjustments were made during the production flow. It is only fair to admit that along with the outstanding job of designing both adjustable metal production tools and burning tools, there was a percentage of luck which blessed the fact that our first try was successful. The value of careful preparation was definitely demonstrated in that every possibility of variation had a check point and could be adjusted in production and was followed carefully, almost one riser at a time. Fortunately, the entire trial run, which was approximately 1500 pieces, came out absolutely perfect, and, except for some small percentage of rejects because of scale (there are several areas on the risers where the steel must be exposed and not covered with enamel, which added another problem of scale in the firing), the pieces were perfect. We've run many thousand since, and have averaged less than 1% rejection. The key to this success is based almost exclusively on the carefully engineered burning tools and fabrication tools.

The shape and projects on the pieces even made packing quite a

problem and several methods of packing and handling between our plant and the customer were tried. The handling within the Harrison Works was a problem and the superintendents and foremen had to work carefully with the chief engineer to get the men used to handling a porcelain enameled riser on the job.

Jigs used for assembly

Elaborate jigs were set up to properly assemble the pieces into place. Carefully developed assembly skill brought the riser up to a point where it solved the Otis problems very economically. Of course, there were the usual problems of a special job such as this, and difficulties were encountered such as storage where the shape of the piece was a disadvantage. Special bins and racks were finally built to store the bank of risers ahead of production.

Although the production is limited as far as volume is concerned, the job has proven to be extremely interesting and an outstanding advertisement for the multitude of uses for enamel. Here is a close tolerance piece which is almost out of the range of tolerance in metal fabrication that must not only meet metal fabrication tolerances but stay within those tolerances after enameling and be used finally as a structural part of an intricate mechanism. It makes one realize that the possibilities in porcelain enamel are really unlimited and that every inquiry, regardless of how fantastic or impractical the use may seem at first glance, should be thoroughly investigated and experimented with before it is considered impossible.

From this job, others have developed, in different styles and models of risers. A larger, wider riser, with complicated braces in the back, was necessary. This presented a whole new set of problems, complicated further because this model, developed in even smaller quantities and elaborate tooling, could definitely not be justified.

A small extremely light gauge veneer piece was required for an older model still in the line which again did not justify elaborate changes in the Escalator itself to adapt it to porcelain enamel. In this case, the enamel piece, in very light gauge metal, had to be welded in assembly into the Escalator, which brought on even further problems.

These last two jobs fell into the category of specials—as limited production was required—but, nevertheless, taxed the ingenuity of every one in our organization and presented a real challenge to us as members of the porcelain enamel industry.

"MR. HUMPHRIS, DON'T RUN AROUND WITHOUT YOUR SLIPPERS."

The "seemingly" impractical

The original riser, even though not requiring very large runs, has proved to be as interesting as it was difficult. We feel that the success that Otis has had in proving to our industry that this job can be done demonstrates the value of working on new and seemlingly impractical uses of porcelain enamel in order to solve customers' problems. When they require a finish such as porcelain enamel yet have a piece that seems impossible to enamel, it is quite possible that that very piece may open a new field for our industry and further demonstrate to other potential users the versatility of the product.

Enamel division program for A.C.S. fifty-second annual meeting

THE 52nd Annual Meeting of the American Ceramic Society will be held April 23 to 27, in New York City. Meeting headquarters and all general functions will be at the Hotel Statler.

At the Annual Banquet on Tuesday evening, Hobart Kraner, of Bethlehem Steel Company, and president of the American Ceramic Society, will present his report. New officers and Fellows will also be installed at this time. Plant trips are being arranged in the New York area for Thursday.

F. A. Petersen, of the Department of Ceramic Engineering, University of Illinois, is program chairman for the Enamel Division. Other officers of the Enamel Division are G. H. Spencer-Strong, Pemco Corporation, trustee; B. J. Sweo, Ferro Enamel Corporation, chairman; and E. E. Marbaker, The O. Hommel Company, Senior Fellow at Mellon Institute, secretary.

The program of the Enamel Division, as released by the Society, is as follows:

Monday Afternoon, April 24

1. *A Thickness Gage for Ceramic Coatings*

CHARLES C. GORDON and JOSEPH C. RICHMOND, National Bureau of Standards, Washington, D. C.

An instrument has been developed for the purpose of measuring the thickness of protective coatings of ceramic materials applied to nonmagnetic metal bases. This instrument provides a non-destructive method of measurement, and can be used for measurements on metallic backings having a wide range of electrical conductivities. Also, the thickness measurement refers to a restricted area and the instrument is, therefore, applicable to curved surfaces. Although this instrument was developed primarily for the measurement of the thickness of ceramic coatings on turbine blades and other high-temperature parts of aircraft power plants, it should be generally useful in thickness measurements of paint, plastic, and other nonconducting films. The presence of magnetic material in the coating or at the coating-metal interface will vitiate the measurements of coating thickness. This instrument was developed as a part of an investigation being conducted at the National Bureau of Standards under the sponsorship and with the financial assistance of the National Advisory Committee for Aeronautics.

2. *Effect of Lithium Oxide on Surface Tension of Silicate Melts*

R. M. WILLIAMS and H. E. SIMPSON, Alfred University, Alfred, N. Y.

The effect of the additions of Li_2O on the surface tension of silicate melts was studied by means of the maximum bubble pressure method. Lithium oxide was added in 0.001, 0.01, 0.05, and 0.1 molar quantities. The influence of these additions was measured on a sodium silicate glass, soda-lime glass, borosilicate glass, ground-coat and cover-coat enamels, and a whiteware glaze. The change in surface tension with increasing lithium content varied with the composition of the melt; the general trend however, was toward an increase. This effect was most noticeable at lower temperatures. The apparatus was standardized using water, benzene, and glasses whose surface tension had previously been determined. An accuracy of approximately $\pm 1.0\%$ at the initial temperature was obtained.

3. *Corrosion Tendencies of Refractories for Enamel Smelters*

JAMES H. HEALY and ALFRED W. ALLEN, University of Illinois, Urbana, Ill.

Twenty-nine brands of refractory brick including silica, semi-silica, fireclay, high alumina, mullite, zircon, magnesite, and forsterite were subjected to three cycles of a cavity type slag test using pellitized raw batches of typical ground coat, grey, titanium, zirconium, and low-temperature frits. Several samples which had been placed in a commercial box type smelter were also available for study. Reactions between enamel glass and refractories were studied by conventional X-ray diffraction and microscopic analysis. Resistance to attack was found to be primarily a function of (1) macrostructure and porosity of the refractory and (2) type of interfacial reaction between glass and refractory. Where an interfacial crystalline layer was formed and was associated with a relatively viscous glassy phase, corrosion was retarded. When the glassy phase was fluid or the refractory such that no layer was formed, corrosion continued throughout the entire test. A table comparing all of the refractories studied has been included.

Tuesday Morning, April 25

4. *Classification and Definition of Delayed Defects in Porcelain Enamels*

J. H. KEELER, P. K. CHU, and H. M. DAVIS, Pennsylvania State College, State College, Pa.

Physiochemically induced defects in enamels on steel, distinguished from defects of mechanical origin, have been divided into (*a*) defects forming at elevated temperature and (*b*) delayed defects which appear spontaneously at an indefinite time after firing.

The delayed defects have been classified according to physical characteristics, which depend upon the properties of the enamel and the degree of its adherence to the steel. All are considered to be caused by the accumulation of gas at the steel-enamel interface. The injury to the coating may take the form of a "shiner" or a "fishscale," especially where adherence is good. In other circumstances, the flaw may become a "splotch," a "bloat," or a "pop-off." Working definitions of these defects are offered.

5. *A Study of Gases in Porcelain Enameling*

P. K. CHU, J. H. KEELER, and H. M. DAVIS, Pennsylvania State College, State College, Pa.

Gas evolved from all delayed enamel defects such as fishscales, shiners, pop-offs, bloats (immature pop-offs) and splotches was found to be substantially pure hydrogen. By the method of microscopic gas bubble analysis, gas from individual reboiling blisters in ground-coat enamel was shown to contain more than 85 per cent of hydrogen.

The water–iron reaction is an ever-present source of hydrogen in enameling. The water is supplied by the dried enamel slip, not only as structural water in clay or salts, but also as part of the glass structure of the frit. Clays containing high percentages of structural water and having high decomposition temperatures tend to increase the production of gas-formed defects.

Enclosed-system experiments revealed that hydrogen is absorbed by steel–enamel interfacial material at 500°C. Similarly, an enamel containing 3% Sb_2O_3 will absorb hydrogen very readily at 500° to 700° C. A study was made of gas evolution in the heating of enamel slip or frit alone, or of one of these with steel. The roles of water and hydrogen in the enameling process are discussed.

6. *An Examination of Reboiling*

J. H. KEELER, P. K. CHU, and H. M. DAVIS, Pennsylvania State College, State College, Pa.

Reboiling of porcelain enamels on steel results from the sudden release of hydrogen trapped in rifts in the metal, the manifestation appearing during reheating when the enamel softens sufficiently to permit the formation of blisters. The influence of the presence of an enamel on one or on both sides of the metal shows that hydrogen from the steel and not carbon or water from the enamel is the immediate cause of

to Page 74 →

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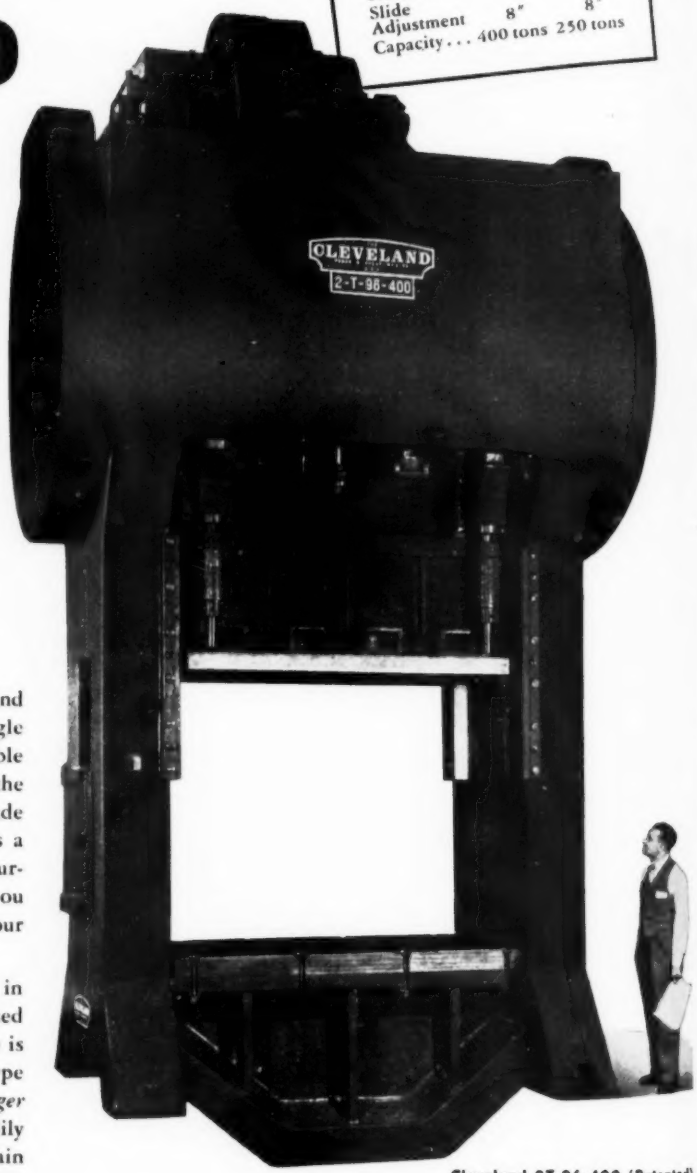
Bed Area F to B and R to L, 22"x32"
Standard Slide Stroke, 3½"
Slide Adjustment, 3"
Capacity, 60 tons

Cleveland No. 8-I
Open Back
Inclinable Press

	Inner Slide	Outer Slide
Bed Area (top).....	60" x 96"	
Stroke.....	33"	22"
Slide Adjustment	8"	8"
Capacity...	400 tons	250 tons



Cleveland 2T-96-400 (Patented)
Double Crank, Double Action
Toggle Press

You may not require a press as large as the Cleveland (patented) Double Crank, Double Action Toggle shown on the right, nor one as small as the Inclinable shown above, but you can be certain that out of the twelve standard types of Cleveland Presses made in a wide range of sizes and capacities there is a Cleveland that meets your exact requirements. Furthermore, our engineers will gladly work with you in designing any special Press required for your more unusual operations.

Many new design features have been included in the present model Clevelands that offer you increased production economies. Outstanding among these is the (patented) Cleveland air operated Drum Type Friction Clutch, which assures *closer control, longer die life* and *minimum rejects.* This Clutch can readily be installed on earlier Cleveland models to obtain greater efficiency and it is also adaptable to other makes of Presses.

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Cold extrusion of steel

including military interest and current progress

by Col. Merle H. Davis • CHIEF, INDUSTRIAL DIVISION, O.C.O., WASHINGTON, D.C.

ALTHOUGH cold extrusion involves the use of punches and dies it should be pointed out in the beginning that extrusion differs basically from drawing. During drawing the work piece is formed by the application of tensile stresses; in extrusion the piece is forced to flow as a result of applied compressive stresses.

The extrusion of metals is accomplished by two types of operations—backward extrusion and forward extrusion.

Backward extrusion (hot or cold; aluminum, copper, brass or steel) forces the metal to flow in a direction opposite to the travel of the punch and is in general an operation of converting a solid cylinder into a cup. Basically, it differs little from the method of piercing billets or bar in the first operation of the conventional pierce and draw method of making shell forgings.

During forward extrusion the steel flows in the same direction as the punch. It flows out of the die ahead of the punch at a greater speed than the ram is traveling, the increase in speed being proportional to the reduction in cross-sectional area. The forward extrusion operation is quite analogous to the squirting of grease from a hand grease gun.

A Technical Industrial Intelligence Committee, under the joint sponsorship of the Military and the Department of Commerce, visited Germany immediately after the war. One thing that impressed them was the widespread practice of the cold extrusion of steel. It appears that about 1934 the German government called together the manufacturers of steel cartridge cases and told them to develop the best method of making steel cartridge cases. A foreman in Kabel and Metallwerke, Nuemeyer, A. G. Nurmberg, proposed the idea of extruding rather than drawing these cartridge cases. The company apparently had tried it during World War I but had been unsuccessful because of lack of good steel for tools and work pieces. The method as finally worked out by Nuemeyer involved a combination of extrusion and drawing. One extruding operation, after cupping, replaced two draws and one anneal-pickle-bonderize in the conventional method. This method was adopted and used by many of the steel cartridge case manufacturers.

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COLONEL DAVIS

So far, military applications of cold extrusion have been limited to hollow cylinder shapes because all investigations have been directed towards ammunition applications. The cold extrusion of steel rods and solid shapes is, however, feasible and may warrant investigation. Forward extrusion of hollow cylinders must be preceded by cupping by any means including backward extrusion. The cup is then placed in a die set-up which restrains the cup laterally but has a restricting ring die opening in the bottom. The punch has a pilot or plug which fits inside the cup. The punch applies pressure, however, to the top—or rim—of the cup, and the metal is forced to escape downward through the annular orifice between the ring die (on the outside) and the plug of the punch (on the inside).

Saving tons of steel

In manufacture of shell, cold extrusion will have its prime advantage in saving tons of steel. The consumption of high grade steel for artillery shell represents a far larger percentage of the total steel used during the war than most people realize. The savings we are now experiencing in the 105 mm shell (6 to 20 lbs. wastage reduced to one pound, or less) means that we may look forward to as much as 40% reduction in our shell steel needs. At a peak point during the war we were using 160 carloads of shell steel per day for 105 mm and 155 mm shell alone.

Another advantage of only slightly less importance is the saving in machining operations. Three simple machining operations are the most they would need on an extruded shell body. These are to cut the band seat, face, bore, and thread the nose, and finally nick the staking notches. A relatively simple single purpose machine could probably do the whole job in one set-up. Still another important advantage is that we can use low carbon, low manganese steel and still get the necessary physical properties by cold working. We have no need for the .90 to 1% manganese that is in

shell forging stock for machineability and hardenability.

With cold extrusion we expect a dividend of improved accuracy from the superior surface finish and concentricity that is present in an extruded shell. Where we must permit a surface roughness of 250 to 500 microinches RMS on a machined shell, cold extruded shell have the same smoothness of the die. This smoothness will give our shell greater range and a reduced dispersion. With the improved concentricity that comes with cold extrusion, our shell will travel more steadily through the air. With their high rotational velocity, shell spin about their axial center-of-gravity, and when the cavity is eccentric to the outside it means that the shell will spin about a point different from its geometric axis.

Less variation in weight

Cold extrusion will give us less variation in weight and that simplifies problems for both Ordnance and the artilleryman. When shell are made from forgings there is such a variation in the weight that we must set up weight zones and after the shell are filled with high explosive we must weigh each one and mark on it the weight zone. The field artilleryman must adjust the elevation of his weapon for the zone weight marking on the noze of the shell. When the cartridge case is tightly crimped to the projectile, as in anti-aircraft or tank ammunition, Ordnance must, at the time of assembly, adjust the amount of propellant powder to compensate for the differences in weight. It is expected that cold extrusion will give us shell of such consistent weight that they will all fall into one weight zone.

Still another advantage that is yet to be fully explored is the possibility that we will not require the same high standards or cleanliness and soundness demanded in shell forging stock. We know that kneading action takes place during an extruding operation breaks up to some extent the inclusions, porosity, and stringers. How much this will permit us to relax our cleanliness and soundness standards we have yet to see.

In applying the cold extrusion method to steel cartridge case manufacture we have similar advantages in mind. Where drawn cartridge cases are made from plate, disced, cupped and then deep drawn in several operations, we are now starting from bar, in itself a cheaper item. In forming the first piece we lose only the width of a band saw cut, whereas we customarily get a yield of 50% in cutting discs from plate.

Before cupping and drawing, a disc in most cases is given a long and costly spherodizing anneal to keep down scrap loss during cupping and drawing. Before extruding a slug cut from bar we will have to give it only a process anneal or a conventional normalizing operation at the most.

Editor's Note:

It is the hope of all true Americans that it may never again be necessary to marshall the forces of industry for the production of tools of destruction to serve in another war. The importance of preparedness, however, is questioned by few.

Many *finish* readers played important parts in the production of shell, shell cases and other ammunition during World War II. These and others with equipment suitable for this work will be extremely interested in this discussion by Colonel Davis.

The saving in operation which we anticipate from cold extrusion has been well demonstrated by the 20 mm steel cartridge case processed pieces made by Stoner Manufacturing Company. Here they backward extrude a deep cup from a hot forged slug, follow it with one forward extrusion and one draw. By the conventional cup and draw method this case would have required four to five drawing operations after cupping. This is, of course, followed by the conventional trimming, heading, tapering, necking and machining operations for both methods. Another advantage especially applicable to steel cartridge cases is high physical properties that we get from the cold extruded pieces. It also seems we get a greater elongation from a cold extruded structure than is normally found by cold drawing to the same strength. This means that in some instances only a low temperature stress relief anneal is all the final heat treatment we need.

Cold extrusion is still to be fully investigated in the realm of high carbon and alloy steels.

Process anneals are being investigated by all the current manufacturers. We do know already that we require fewer process anneals than in conventional cup and draw methods, yet we do not know just how far we can go in eliminating these intermediate anneals. The savings that can be derived in plant space, equipment cost and expenditure of gas or oil, is almost as great as that for the actual forming operations.

We have at present been directing applications towards large items as, for example, our proposed contract for the 95-lb. 155 mm shell. We are, nevertheless, not forgetting that the process may well be applicable to smaller items. In our first contract, the process was demonstrated to be fully applicable to the tiny 2000-gr. 20 mm shell and the ½ lb. M1 burster casing. Frankford Arsenal is right now applying the cold extrusion techniques to the manufacture of the 1.8 lb., 57 mm shell body. There are many primer, fuze, and even bomb parts that are wastefully machined from bar or wrought forgings that may be economically made by cold extrusion on relatively light press equipment. Of course, our prime interest has been directed towards our large tonnage items because savings there are more impressive, but we are putting ourselves into a critical press capacity field because of the large tonnage presses that are required for, at least, the first operations. There are a multitude of small pieces that may well be economically manufactured on the machinery found in the average small press shop.

Steel consumption

High explosive and chemical projectiles accounts for about 56% of total army ammunition consumption of steel during the last war. The remaining 44% was divided up among such items as bombs, steel cartridge

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CONLON-MOORE MFG. APPTS.

Two key appointments in the enameling department of the Moore Division of Conlon-Moore Corp., Joliet, Ill., were announced recently by M. V. Phelan, general superintendent.

Prince Hayles, who recently joined Moore as general foreman of the enamel department, was named superintendent of the department to succeed James Snevely who died January 19.

Leonard Lodestro, who has been connected with the porcelain enameling industry for a number of years, joined Moore as general foreman of the enamel department. Lodestro's previous experience includes positions at Crown Stove Company, Cribben & Sexton Company, and Lawndale Enameling Co., all of Chicago.

HOUSEHOLD WASHER SALES UP 59.8% IN JANUARY

Factory sales of standard-size household washers in January showed marked increases over both the preceding month and January, 1949, according to industry-wide figures announced by the American Home Laundry Manufacturers Association. The January total was 275,576 units, an increase of 59.8 per cent over January, 1949, and up 16 per cent from December.

Ironers sold in January aggregated 20,300, compared to 19,400 in December, and down 28 per cent from January, 1949. Dryers showed an increase of 27.5 per cent over December, 19,495 compared to 15,282, and were up 106 per cent over January, 1949.

1900 ACQUIRES DRYER PLANT

A factory for the production of gas and electric clothes dryers has been acquired by Nineteen Hundred Corporation, manufacturers of Whirlpool home laundry equipment.

Acquisition of two buildings in St. Joseph, Michigan, was announced by Elisha Gray, president. Gray said that the structures provide 75,000 square feet of production space.

The new dryer plant will be in operation within five months, the company said. Present dryer manufacturing operations will be moved there without loss of production, and space now used for making dryers will be devoted to production of automatic washers.

LOCKE ADVANCES KELLER

Karl H. Keller has been named assistant to E. M. Skipper, vice president of manufacturing, Locke Incorporated, Baltimore, Md. He joined the Locke organization from the Miller Company, Meriden, Conn., following a number of years in the field of manufacturing engineering.

Immediately following his graduation from the Case School of Applied Science in 1933 with an M.S. degree in mechanical engineering, he was employed by the Glass Machinery Division of General Electric Co. as a design engineer. He was employed in different G-E divisions until 1942, when he joined the Columbia University Division of War Research, under the auspices of the National Defense Research Committee, as a project engineer. In 1946, he joined the Miller organization.

BRAND HEADS LP-GAS DRIVE

Lee A. Brand, vice president, Empire Stove Co., Belleville, Ill., has been elected chairman of the national committee for LP-gas promotion, succeeding the late John C. Pankow, of Detroit-Michigan Stove Co.

Directed chiefly at the home market beyond the city gas mains, the promotion is being co-sponsored by the Liquefied Petroleum Gas Association, Natural Gasoline Association of America, and Gas Appliance Manufacturers Association.

MACON JOINS PENNSALT

J. Ralph Macon has joined Pennsylvania Salt Manufacturing Company as an engineer in its market research division, according to George T. Collins, manager of the division.

Formerly associated with DuPont's electrochemicals department, Macon will work on market development of new products for the metallurgical industry. He was graduated from Emory University in Atlanta in 1941, and is a member of the American Society for Metals.

ULTRASONIC METAL CLEANING A FUTURE POSSIBILITY

Before a recent meeting of the Albany Society of Engineers, Dr. Robert O. Fehr, a General Electric engineer, told how high frequency sounds can strip grease from metal in a matter of seconds.

Dr. Fehr said that "ultrasonics", sounds pitched too high to be heard by the human ear, can be extremely useful to industry, particularly in tedious cleaning operations. He emphasized, however, that ultrasonics are not likely to be put to work cleaning dishes and clothes in private homes in the near future. The special needs of ultrasonic generators for these purposes would necessitate a large supply of electric power at a frequency hundreds of times higher than the usual 60-cycle household current. →

In tests at the G-E general engineering and consulting laboratory, small metal parts were cleaned of grime and grease in less than ten seconds by ultrasonics. Cleaning the parts by methods usually used would have required several separate operations and at least an hour's time, he said.

"Use of ultrasonics in the home is not yet practical, but the sound waves certainly can be put to good, economical use in industry," said Dr. Fehr. He envisioned ultrasonics cleaning tanks along production lines, through which small parts would pass and be cleaned.

DE VILBISS SPRAY FINISHING SCHOOL 25 YEARS OLD

The photo above shows a typical class of representatives from some of the country's industrial firms enrolled at the DeVilbiss Company's school for spray finishing, now in its twenty-fifth year. Instruction is free of charge and a year-around schedule of one-week classes is offered. Sessions are rotated to cover the needs of specialized groups such as industrial equipment users, contract painters, plant maintenance men, and automotive reconditioning and appearance maintenance men.

WIREBOUND INSTITUTE GRADUATES 200 ENGINEERS

Nearly 200 members of the wirebound shipping container industry will be graduated by May 12 from the Wirebound Institute, according to Wirebound Box Manufacturers Association which inaugurated the Institute three years ago. The course consisted of 30 lessons, covered by mail, and five periodic "clinic" sessions at which personal attendance was compulsory.

The graduates received certificates attesting that they were technically qualified to design wirebound boxes and crates that will provide proper protection in handling for the products of industry and agriculture.

"Wirebound Engineer" certificates were to have been awarded the graduates at the sixth transcontinental series of clinics scheduled for Jacksonville, Fla., March 6; New Orleans, March 13; Louisville, March 16; New York City, March 23; Toledo, March 27; Chicago, March 30; and Los Angeles, May 12.

The curriculum and individual lessons were prepared by Henry A. Wolsdorf, of Package Research Laboratory, who, together with E. F. Gallivan, of Wirebound Box Manufacturers Association, directed the course and conducted the clinic sessions.

L. S. Beale, Association secretary, said that the "whole wirebound shipping container industry—and users of wirebound boxes and crates—will benefit immeasurably from the greatly widespread technical 'know-how' resulting from the Wirebound Institute course of training."

FORMER BATTELLE HEAD DIES

Dr. Horace W. Gillett, 66, former director of Battelle Memorial Institute, died March 3.

One of the world's foremost metal scientists and a one-time associate of Thomas A. Edison, Dr. Gillett was the inventor of many metallurgical processes and author of scores of books and articles on scientific subjects.

He was responsible for the technical organization of Battelle Institute and served as its first director from 1929 to 1934. At the time of his death, he was serving as a technical consultant to Battelle, having retired as chief technical advisor of the Institute in early 1949.

During the war, Dr. Gillett served on the Advisory Committee on Metals and Minerals to the War Production Board and as a member of the Research Division of the War Metallurgy Committee.

ARMOUR RESEARCH APPT.

Clark E. Thorp has been named chairman of chemistry and chemical engineering research at Armour Research Foundation of Illinois Institute of Technology, it has been announced by William E. Mahin, director of research.

An authority on ozone technology, Thorp will head a department of 95 scientists and technicians now engaged in research projects for industrial concerns and government agencies. He has been associated with the Foundation since 1941.

REVEAL GAS APPLIANCE SALES FIGURES FOR 1949

Expanding the available figures of reporting companies to represent the entire industry, domestic gas range unit shipments for 1949 amounted to 2,061,500 units, 31.1% below the previous year, according to a report released by the Gas Appliance Manufacturers Association. Reporting companies shipped 1,236,915 gas ranges during the year with the manufacturers' value of these shipments amounting to $112,174,000.

Total industry shipments of auto-

matic gas water heaters approximated 1,411,500 units; 164,000 of these were for use with liquified petroleum gas. These figures represent total industry shipments and are based upon reports received from manufacturers approximating 95% of the industry. Reporting companies indicated that their unit shipments of the water heaters totaled 1,340,901 with the manufacturers' value of these shipments amounting to $66,837,000, said the GAMA report.

UNIVERSAL'S NEW RANGE FACILITATES KITCHEN PLANNING

The new Universal "Select-a-Range" can greatly facilitate kitchen planning, according to its manufacturers, Landers, Frary & Clark, of New Britain, Conn.

The new range, consisting of an oven, four top-surface heating units, and storage drawers, can be arranged more than 25 different ways and can "grow" as the kitchen is enlarged, it was stated. Counter space between the oven and surface cooking units can be expanded in any manner the housewife chooses to create island or peninsula work centers, and concentrate storage at points-of-use. Each unit is complete in itself. Photo shows one way to set up the modular kitchen units.

The new range was one of the outstanding home appliances introduced at the recent winter homefurnishings market in Chicago *(page 22, February 1950 finish)*.

NEW METHOD EXTRACTS IRON ORE FROM TACONITE

A new method for using the low grade iron ore from the Mesabi Range in Minnesota to offset the depletion of rich ores has been revealed. The method employs an improved type magnetic separator to aid in concentrating low grade iron ores.

The device was developed by Jeffrey Manufacturing Co., Columbus, Ohio, with magnetic design assistance from Westinghouse Electric Corporation.

Phelan McShane, consulting mining engineer for Westinghouse, disclosed that the new ore separator operates on a somewhat different magnetic principle than previous devices of its type. The unit consists of a rotating drum mounted in a pulp box of special design. Stationary magnets inside the drum provide the means whereby iron ore is extracted from taconite, a formation of 25 per cent iron and 75 per cent rock.

"As the mixture passes beneath the separator's rotating stainless steel drum," McShane explained, "the magnets draw the magnetic iron ore from the mixture to the drum. The movement of the drum carries the ore through a washing zone and then away from the direct pull of the magnets, depositing it in a trough leading to further grinding stages."

The system is being used in the Aurora, Minn., plant of Erie Mining Company, helping to extract magnetic iron ore from magnetic taconite. The ore nodules produced contain about 64 per cent iron, which is said to be several per cent higher than the high grade ores now used in blast furnaces. These ore nodules are now being produced at the plant at the rate of 200,000 tons a year.

NEW BRIGGS FACTORY MANAGER

Arnold Kohler has been named factory manager of the Plumbing Ware Division of Briggs Manufacturing Co., Detroit, according to an announcement. He succeeds J. W. Sampson.

ING-RICH NAMES BOARD CHAIRMAN

Ingram-Richardson Manufacturing Co., Beaver Falls, Pa., has announced the election of L. W. Ingram as chairman of the board of directors and H. Mc E. Patton as executive vice president. Other officers reelected include J. F. Ingram, president; J. H. E. McMillan, vice president in charge of sales; Wm. J. Tress, secretary and treasurer; D. L. Brooks, assistant sec-

retary and assistant treasurer, and controller.

E. E. Reagle was elected president of Ing-Rich Metal Products Co., East Palestine, Ohio, succeeding J. F. Ingram who was named chairman of the board. Reagle formerly was executive vice president.

SAFETY RECORD AT YOUNGSTOWN

The tube scheduling and shipping department of the Campbell Works of The Youngstown Sheet and Tube Company has something new to show visitors. It is a bronze plaque presented to the department recently for working 2,000,000 man-hours without a disabling injury.

During the period which began March 10, 1944, the department shipped approximately 3,000,000 tons of pipe—enough to circle the world more than seven times. It required 104,000 cars to ship this material. The department used 11,500,000 board feet of rough hard wood and 24,000,000 feet of wire to stock and ship the pipe.

FOOTE MINERAL SPONSORING $1000 LITHIUM AWARD

Foote Mineral Company, Inc., has announced that it is sponsoring a $1000 "Lithium" Award Program. This program has a double purpose of stimulating scientific research directed toward the use of lithium materials and of making the results of these studies generally available, it was stated.

The program provides for eight awards for papers embracing the ceramic industry wherein the use of any natural or manufactured lithium containing compound may be applied with accompanying benefits. To qualify, the research or development should be conducted during 1950.

Research or development conducted prior to January 1 will be eligible provided further progress and improvements is made during this year. In such cases, the paper shall cover the progress of improvements made during this year. It was stated that students in ceramics and ceramic engineering may report on studies initiated at the beginning of their 1949-50 school year. The period shall terminate January 1, 1951. All papers must not heretofore have been made public.

The eight separate awards, totaling $1000, consist of: Grand Award, $500; 2nd Award, $200; 3rd Award, $100; 4th award, $75; 5th Award, $50; and 3 Honorable Mentions, $25 apiece.

The subject matter shall consist of one of two subjects: (1) Formulation of new or reformulation of existing compositions to include the use of a natural or manufactured lithium containing compound or ore; (2) Fundamental or basic physical and chemical study related to ceramics directed toward use of a natural or manufactured lithium containing compound.

Each individual or group intending to participate in the Award Program must submit an entry form before midnight July 1 to: Mr. John D. Clark, Foote Mineral Company, 18 West Chelten Ave., Philadelphia 44, Penn.

MACDONALD HEADS HOUGHTON

At the annual stockholders meeting of E. F. Houghton & Co., manufacturers of industrial oils, leathers and chemicals, William F. MacDonald, treasurer, was elected president.

SANITARY ENGINEERING GROUP ADOPTS TESTING LABORATORY

The Plumbing Testing Laboratory which has been maintained for several years by the Water Pipe Extension Division of the City of Chicago, has been adopted by the American Society of Sanitary Engineering as its official testing laboratory.

The American Society of Sanitary Engineering Laboratory has been established as a nationally accepted testing station for manufacturers of plumbing fixtures, appurtenances, appliances and equipment where tests for efficient and economical operation and the elimination of health hazards are made in the interest of safety and public health protection. The object of the program is also to promote uniformity of plumbing equipment and national acceptance of same, it was stated.

Officers of the Society's Plumbing Testing Laboratory are: John K. Dorsey, president; H. L. Schaller, vice president; and William M. Readey, secretary.

BJORKSTEN OPENS N. Y. OFFICE

Bjorksten Research Laboratories, Inc., Chicago, have established an office in New York City, according to Dr. Johan Bjorksten, president. The company specializes in technical development work for industry on a contract basis.

AMERICAN BOX EXPANSION

The appointment of James G. Witte as general sales manager of The American Box Company and The American Wood Products Company, main plant in Cleveland, Ohio, and branch plant at Marion, S. C., keynotes a major expansion program in progress at both firms.

Witte formerly directed all packaging for Montgomery Ward & Co., was national director of the Society of Industrial Packaging Engineers, and past president of the Illinois group.

AGA 1950 CONVENTION COMMITTEE

George E. Whitwell, vice president, Philadelphia Electric Company, has been appointed chairman of the American Gas Association 1950 General Convention Committee, it was announced by Hugh H. Cuthrell, AGA president, and vice president, The Brooklyn Union Gas Company.

Other members of the committee which will be responsible for all the arrangements for the AGA 32nd Annual Convention, to be held at Atlantic City, October 2-6, are:

Frank H. Adams, president, Surface Combustion Corp., Toledo; L. L. Baxter, president, Arkansas Western Gas Co., Fayetteville, Ark.; R. R. Blackburn, vice president and secretary, Southern California Gas Co., Los Angeles; Henry Fink, president,

Your Guarantee of UNIFORM QUALITY

Yes — the "Frit Masters" label on every Century frit bag is your guarantee of uniform quality in every single bag of frit in a 100 pound or a 100,000 pound order. The label may read sheet iron frit or cast iron frit, smelt No. 1100 or smelt No. 1400 and blue, white or ground coat — the "inside" answer is the same — Uniform Quality.

Century customers who have used millions of pounds of frit from "Frit Masters" labeled bags find that frit purchased in 1930, in 1940 or in 1950 can be depended upon to deliver uniform results in the enameling plant and uniform finish on the final product.

Century has the laboratory and the technical staff to keep up to date and to offer customers every worth-while improvement. Century has the plant equipment and the plant personnel to maintain uniform quality in production frits.

Our experimentation and development work are confined to our laboratory and our plant. When you buy frit in the "Frit Masters" bag you are buying time-proved frit that has passed the tests of time and production application before it is offered for sale. This means "money in the pocket" and shows in the "profit" statement at the end of the year.

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FRIT MASTERS

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Michigan Consolidated Gas Co., Detroit.

A. J. Gonnoud, president, Kings County Lighting Co., Brooklyn; Dorr P. Hartson, vice president and general manager, Equitable Gas Co., Pittsburgh, Tenn.; L. E. Knowlton, executive vice president, Providence Gas Co., Providence, R. I.; Lovett C. Peters, vice president, The Laclede Gas Light Co., St. Louis. Earl Smith, president, South Jersey Gas Co., Atlantic City; and Kurwin R. Boyes, AGA secretary, convention manager.

U. S. STEEL ENGR. APPT.

Frank R. Burnette has been appointed assistant engineering vice president of United States Steel Corporation, according to an announcement by M. W. Reed, vice president. In his newly created position, Burnette will have special duties in connection with the future construction programs of the company.

MAYPOLE PARTY DATE SET FOR MIDWEST ENAMELERS

Ed Bolin, president of the Midwest Enamelers Club, has announced that the annual Maypole Party will be held on May 19, at the Sportsman Golf Club, Chicago.

Co-chairman of the Maypole Committee and also acting as the prize committee are Bud Friedmann and Chuck Field, of Chicago Vit. C. M. Swan, of Carnegie-Illinois Steel Corp., is head of the entertainment committee. Fred Petersen, of University of Illinois, and Mel Gibbs, of Inland Steel Company, are co-chairmen of the golf committee. Jerry Svec, Club secretary, heads the ticket committee.

COLUMBIA U. CONDUCTING BASIC RESEARCH IN ELECTROPLATING

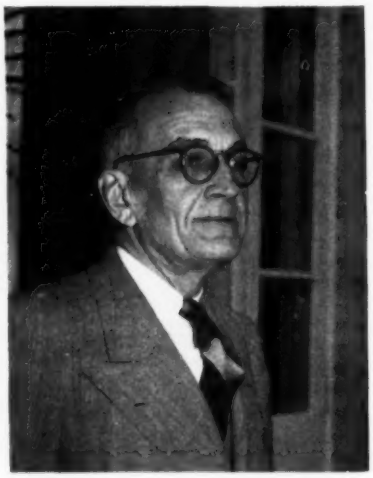
Columbia University's Department of Chemical Engineering is conducting basic research in electroplating under an annual $1700 grant from the American Electroplaters Society. The study is a cooperative research project of the metal finishing industry.

The grant provides for a $1200 fellowship and an additional stipend of $500 for the department to support the research. The first holder of the fellowship is Edward B. Saubestre, a Ph.D. candidate. Under the terms of the fellowship, Saubestre is permitted to combine his research work with his doctoral studies.

The work is being conducted under the direction of Prof. Henry B. Linford, of the Chemical Engineering Department.

EMBRY HEADS WIREBOUND BOX ASSOCIATION

Norris W. Embry, president of General Box Company, was elected



president of the Wirebound Box Manufacturers Association at its annual meeting at St. Simon's Island, Georgia, March 2 and 3. He succeeds Ramsey Simmons, of Elberta Crate and Box Co., who served two one-year terms. Simmons was elected vice president for the coming year.

New directors of the Association include George Kubes, of American Box Co.; Shelley Schuster, of Great Southern Box Co.; and John R. Miller, Jr., of T. R. Miller Mill Co., who succeeds his father, the late John R. Miller.

The rest of the directors, who were reelected, are as follows:

A. L. Whiton, Chicago Mill and Lumber Co.; R. F. Miles, Rathborne, Hair & Ridgway Co.; J. B. Adkins, Adkins Manufacturing Co.; E. S. Barnhill, Indianapolis Wirebound Box Co.; Stanley C. Craven, California Barrel Co.; D. R. Gooding, Wisconsin Box Co.; F. J. Martin, Jr., Martin Brothers Box Co.; L. O. Crosby, Crosby Forest Products Co.; and Embry and Simmons.

Reports from members of the Association, who represent more than 85% of the national production of wirebound shipping containers, indicate that volume production of the industry during 1950 will hold high levels, provided industrial production generally does not suffer drastically severe setbacks as a result of the coal or other strikes.

The number of wirebound containers produced last year for all uses increased 10%, it was stated at the meeting.

STEEL CASTING RESEARCH

As part of its extensive research program, Steel Founders Society of America has initiated a special project directed to investigating and evaluating all known information on the removal of excess metal normally developed in the production of steel castings.

In seeking more complete comparative information based on actual operating experience, restudy of all established methods will be made, together with independent investigation of latest developments in the field, it was stated.

Experimental studies are being carried out in a selected steel foundry with the cooperation of a recognized university engineering and research organization, according to F. Kermit Donaldson, Society executive vice president.

Member foundries are contributing individual experience records and pooling information on equipment and suggestions on possible design changes or new equipment. The project is being carried out under the direction of Charles W. Briggs, technical and research director.

HOTPOINT NAMES WESTFALL MANAGER OF MARKET RESEARCH

The appointment of George W. Westfall as manager of market research for Hotpoint, Inc., has been announced by Fred J. Walters, vice president of marketing.

It was stated that Westfall will direct market analysis and forecasting related to the company's line of 12

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* IF YOU KNOW HOW

Our service is complete from blueprint to shipping carton.

A quick sprint, a pole properly placed, a burst of almost super-human power and up he goes! Up and over, perhaps to win a championship.

But what a lot of "know how" it takes! The "know how" that comes only through constant training, careful attention to details and the desire to improve and excel.

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Titanium enamel direct to titanium steel

a review of the progressive steps in the use of one coat white direct to steel at Westinghouse Electric Corp., Mansfield, Ohio

by J. B. Simons • ENAMELING SUPERINTENDENT

THE application of porcelain enamel covercoat direct-to-steel base, with the resulting elimination of the traditional groundcoat, has long intrigued and fascinated the enameler.

Until quite recently, this project met with about the same degree of success as did the transmutation of base metals into gold by the alchemists. However, both searches were motivated by the same desire: to make a profit.

The necessity of first applying a dark blue or black coating and then having to cover this with white has never seemed fundamentally correct. The logical solution to this age-old problem seems to be near at hand, now that an inert steel and compatible enamels are available.

Our first introduction to the possibilities

Our first introduction to the new steel and its possibilities was in an article in *finish* magazine, January, 1944 (*"Will We Have One-Coat Porcelain Enamel Finishes Applied Directly to the Base Metal?"*). Then at a postwar planning meeting, in March, 1944, the president of a frit producing company stressed the need for thinner coatings and set the ultimate goal for .005" thickness. He also predicted that, once attained, it would be the greatest contribution to volume sales of porcelain enamel that could happen. He then presented samples of the new steel with a zirconium covercoat at less than .010" thickness. Considerable discussion on this subject was also reported at the American Ceramic Society Convention of that year, and in June we received a report from another frit producer that his company was making progress along these lines.

A 75% reduction from prewar thickness

After management's decision to proceed with the titanium-enamel project,

finishfoto

C. L. VAN DERAU

The accompanying article forms part of a complete report and demonstration presented by Mr. Van Derau, works manager, R. F. Bisbee, quality control manager, and Mr. Simons before three of the country's enamelers' clubs (see March 1950 finish).

it was necessary to select a range part as the basis for the work to be done. The heater platform was chosen, as it was the most logical for the following reasons:

1. Inherently high dollar value.
2. Sag resistance requirements, both in enameling and in operation.
3. Vulnerability to assembly and field damage.
4. Acid and abrasion resistance requirements and general overall appearance.
5. A thickness analysis of Westinghouse and competitors' platforms showed at the highest point .024" average thickness (prewar) which presented a challenge for lowering thickness.

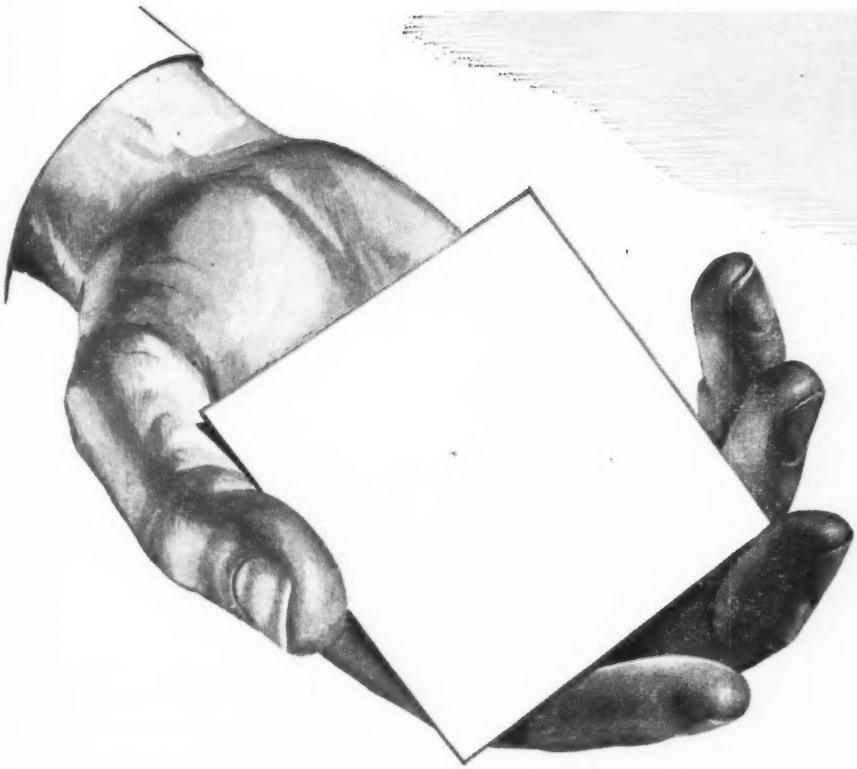
Incidentally, the average thickness in the direct on steel process is about .0065 or almost 75% reduction over prewar figures.

The first production order of the steel was received in March, 1947. At this time, routine physical tests were run by receiving inspection and observations were also reported in the press department. Both of these reports indicated no great variance from normal.

The pickling was done on an improvised set-up in order to deposit .05 grams of nickel per square foot of steel. Neowite titanium enamel was applied at 30 grams per square foot. This material was selected because of our success in its use over groundcoat in our standard production at that time.

Early firing characteristics

Laboratory tests and production furnace checks had indicated 30° to 40° more fire would be required for direct-to-steel application, and, therefore, these first platforms were run at 1560°. It should be noted, at this point, that two years ago an additional fire was given all platforms in order to fire the screen processed lettering. This was an advantage because the original enamels were benefited by additional firing. The finished product was smoother and underfire boil was eliminated. →



Now TITANOX-TG-400 for BLUE-WHITE titania enamels . . .

***PLUS*— All the production and color uniformity advantages of the free-flowing titanium dioxide of high purity — TITANOX-TG.**

In TITANOX-TG-400 we have modified TITANOX-TG to yield the blue-whiteness desirable in many porcelain enamels. The number "400" has been added to the name "TG" to denote increased relative reflectance in the 400 millimicron or blue range of the visible spectrum of white enamels.

Through special processing the chemical composition of TITANOX-TG-400 is rigidly controlled to yield blue-whiteness *uniformly* in those titania frits in which titanium dioxide influences color tone.

Thus, where blue-whiteness is of prime importance TITANOX-TG-400 may be preferred to TITANOX-TG, so useful for maximum opacity.

TITANOX-TG-400, like its parent product, TITANOX-TG, also affords the following advantages in production: flows readily in the dry state; does not stick or ball up; eliminates pre-mixing and hammer milling when dry blending in most cases; decreases sludging out in the smelter.

Frit makers are invited to write immediately for further information, samples and prices of TITANOX-TG-400. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; 104 South Michigan Avenue, Chicago 3, Ill.; 2600 South Eastern Avenue, Los Angeles 22, Calif. Branches in all other principal cities.

B162

® TITANOX

the brightest name in ceramics

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

The laboratory reports on the above production of May 6, 1947, showed:

1. Excellent shatter resistance to a 70° twist at .004″ to .008″ thickness as compared to groundcoat plus standard white which failed at 45° with .016″ thickness.

2. In spite of only fair adhesion by normal standards, samples in torsion test indicate much more damage resistance than regular process. *(See "A Torsion Test for Enameled Steel," February, 1950,* finish.)

3. The color was too creamy, due to increased temperature.

4. The process showed great promise for improvement in quality, cost reduction, and simplication of design.

The next test run was September 18, 1947. Enameling results on first fire were: 122 run—6 OK or 5%. Defective parts included, 35 defective spray, 12 dirt and scale, 6 lumps, 30 pickle stain (due to temporary setup), 8 damaged, 12 die pinch, 2 steel blister, 4 boil, and 3 grease.

Results after only spotting rejects were: 116 run—107 OK or 92%. Rejects showed 5 dirt and scale and 4 pinch marks.

These results indicated that reboil was absent and that rejects were of a controllable nature and not caused by the steel or enamel. This was a very important conclusion and a turning point in our development. The general appearance of the platforms was greatly improved over standard production in that they were smoother, gloss was higher, and texture better. Thickness ran from .005″ on flat surfaces to .010″ on rear corners, in fact a sawed section through the flat looked very much like paint in regard to thickness. It was also noted that scratches or steel defects are greatly magnified; therefore, metal finish requirements are the same as for paint application. Twenty-five percent of the platforms had lines of varying intensity. They ran very straight and parallel, perpendicular to the front and extending into the back splasher. These lines would not pass our quality standards. The elimination of these lines continued to be a major requirement of the steel making process until a very recent date.

Field tests were arranged for this lot of platforms and plans made for future inspections. A summary of this lot contained these predictions, "If lines can be completely eliminated from this steel, the new combination of steel processing and enamels may change enameling procedure to one almost paralleling painting. That is, the ware would be spray cleaned, pickled, nickel-coated and then sprayed in pressurized spray booths, transferred to furnace, fired and delivered. The absence of all reboiling makes this possible. We believe this process has such great possibilities that preliminary cost estimates should be made by the Manufacturing Committee."

Pickling machines rebuilt to provide nickel

On the basis of these reports, our pickling machines were rearranged to include a nickel tank and filtering

For over 30 years... in the service of over 30,000 customers... Signode Steel Strapping Company has devoted its energies and resources to the development of methods and materials that insure safe transit for *all* kinds of products.

To implement this activity, Signode has long maintained its own packaging laboratory, complete with shock, vibration and impact testing equipment. Signode operates the only outdoor railroad test track used exclusively for perfecting methods of bracing carload shipments. Signode employs a staff of trained field engineers, solely for the benefit of customers for development work in the field.

Yet these are only a few of the reasons why... *THIS SEAL MEANS SECURITY IN SHIPPING.*

SIGNODE®

If you would like to find out what we've learned about packaging and shipping *your* kind of product ... reducing costs, minimizing damage claims, improving customer good will ...

SIGNODE SUBSCRIBES TO THIS PREMISE:

"All manufacturing, engineering and quality efforts are in vain if the product reaches its destination in a damaged condition."

This statement appeared in the January 1950 issue of Finish, announcing the objectives and test procedures of the National Safe Transit Committee.

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2639 N. Western Ave., Chicago 47, Ill.

We ship ..... Send me details on Signode's 6-point System of Shipping Protection.

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Company .....

Address .....

City ..... State .....

equipment. Since that time a permanent set-up has been in operation to deposit nickel on all ware regardless of ultimate finishing system used.

As a result of the inability of the frit companies to develop a frit that would burn down with regular ware, less than 500 platforms were processed in 1947. This was because a special fire was required at that time.

In March, 1948, the first field check of titanium enamels on titanium steel showed:

1. All in excellent condition, no fishscale, and high resistance to scratching and abrasion during use.

2. Customers expressed ease of cleaning and resistance to damage and also commented on high luster.

3. No damage at heater openings.

4. Showroom appearance after six months' service.

Since the frit companies had not made the necessary progress in order to fire the direct-to-steel covercoat along with the regular ware, our efforts were for several months confined to processing samples and improving shop practices so that when the frit was available we could proceed in production.

General specifications established

During this interim, we did establish a number of specifications of which most are still in effect today. They are as follows:

1. Use only the stamped side of the steel sheet for finished side of product.

2. Maximum safe thickness limits were set by laboratory at .012".

3. Braces or clips spot-welded to underside of finished surfaces should be eliminated because of metal finishing hazards.

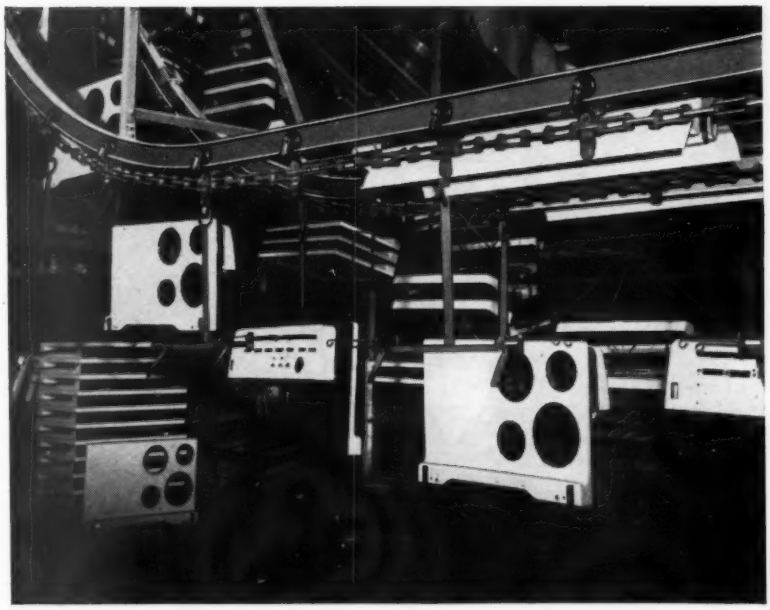
4. Establish critical inspection for scratches and die or handling marks prior to spraying.

5. Wipe parts with tack rags before spraying operation.

6. Be sure no excess rust is on the ware prior to pickle, since poor adhesion will result.

7. Control nickel deposit between

to Page 67 →



WEBB CONVEYORS SPEED Hotpoint RANGE PRODUCTION

Industrial production history was made when Hotpoint, Inc., Chicago, began to make electric ranges in its completely mechanized "world's largest range plant." A vast network of more than 7 miles of overhead materials handling equipment permits amazing speed and high quality manufacturing. The production cycle from steel stocks to finished ranges takes less than one day.

WEBB conveyors are an integral part of the Hotpoint manufacturing process.

WEBB Conveyor Systems are "tailored" to the requirements of any plant, large or small . . . and soon pay for themselves in higher efficiency and lowered production costs.

JERVIS B. WEBB COMPANY

OFFICES IN PRINCIPAL CITIES

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DETROIT 4, MICH.

MANUFACTURERS OF OVERHEAD AND FLOOR TYPE CONVEYORS

NEWS → *from Page 56*

major kitchen and home laundry appliances. He has had more than 15 years' experience in the field of market research and commodity analysis.

MORE SELLING, LESS PREDICTING

More real sales effort without undue attention to "forecasts" of either the optimistic or pessimistic variety is urged by E. K. Welles, president of Charles H. Besly & Co., Chicago, as a steady but sure fire formula for improved business.

KETTERING TO ADDRESS LUBRICATION ENGRS. MEETING

Charles F. Kettering, a pioneer in the development of the modern automobile, and former vice president and director of General Motors Corporation, will be the banquet speaker at the 5th annual convention of the American Society of Lubrication Engineers, Hotel Statler, Detroit, April 10, 11, and 12. Kettering's subject will be "Lubrication–the Insurance Policy of Production."

HARNISCHFEGER APPOINTMENT

The appointment of A. G. Hendrickson as assistant sales manager of

the P&H Welding Division has been announced by Harnischfeger Corporation, Milwaukee, Wis.

Hendrickson has had a number of years of experience with P&H, serving for five years as welding engineer in the Milwaukee and Minneapolis territories. He will be assistant to Melvin O. Monsler who recently was promoted from assistant to sales manager.

The firm's products in the welding field include arc welders, welding electrodes, welding positioners and welding production control systems.

DR. MARBAKER HONORED

Dr. Edward E. Marbaker, senior fellow, O. Hommel Fellowship, Mellon Institute, received recognition for outstanding service to the Philadelphia Section of the American Chemical Society at a banquet held recently at the Franklin Institute.

The occasion was the 50th anniversary of the founding of the Philadelphia Section of which Dr. Marbaker was vice chairman in 1920. One of 42 prominent present and former leaders of the Section to be honored, he received a handsomely inscribed citation.

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Sheets — Plates — Rounds ● Squares ■ Hexagons ● Flats — Angles L
Channels U Sections Pipe ○ Nuts ◎ Welding Rod

There Is No Finer Quality Alloy Available than MISCO METAL for ENAMELING FIXTURES

We Have Over 200 Items of Heat Resisting Alloy Mill Forms in Warehouse Stocks Ready for You

WE SPECIALIZE IN A.I.S.I. TYPES 330, 310, 309, 430

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Federal is the *world's largest* manufacturer of enameled kitchenware.

Federal is also supplier of porcelain enameled parts to the *world's largest* manufacturers of stoves, refrigerators and other household items.

World's Largest means these advantages to you...

huge plant facilities for economical production
experienced engineers and good workmanship
production know-how with guaranteed deliveries

We will welcome the opportunity to quote to your specifications . . . or to offer you a complete service from design to finished product. Write, wire or phone today.

FEDERAL ENAMELING & STAMPING CO.
World's Largest Manufacturer of Enameled Kitchenware
PITTSBURGH, PENNSYLVANIA

BLEININGER CERAMIC AWARD

Stuart M. Phelps, senior fellow, Mellon Institute, and director of research and tests, American Refractories Institute, was presented the 1950 Albert Victor Bleininger Award, regarded as the highest honor conferred in this country for "distinguished achievement in the field of ceramics," at the March 10th meeting of the Pittsburgh Section of the American Ceramic Society.

NEW BOARD AND OFFICERS FOR MIDWEST ENAMELERS CLUB

At the March 4th business meeting of the Midwest Enamelers Club, formerly the Chicago District Enamelers Club, members voted for a new set of by-laws which provides for the Club's operation under a board of nine members.

Nineteen men were nominated to the board. All members present voted for nine with the nominees receiving the greatest number of votes selected in order as board members. The three receiving the highest number of votes will hold office for three years. The succeeding three receiving the next highest number of votes in order will hold office for two years, and the next 3 will hold office for one year.

Those selected for three-year terms are: Dr. A. I. Andrews, head of Department of Ceramic Engineering, University of Illinois; Dana Chase, editor of *finish;* and George Tuttle, Benjamin Electric Mfg. Co.

Selected to serve two-year terms are: Marcel Pouilly, The DeVilbiss Company; Waldo Higgins, A. O. Smith Corporation; and Wayne Derringer, A. O. Smith Corporation. Those to serve 1-year terms are: Rudyard Porter, Carnegie-Illinois Steel Corporation; J. J. Svec, Ceramic Industry; and F. A. Petersen, University of Illinois. (Also serving on the council are two past-presidents, G. W. Hofstetter, Ferro Enamel Corp., and E. P. Bolin, Chicago Vitreous Enamel Product Co.)

At a dinner meeting, held March 14, the new board elected the following officers: F. A. Petersen, president; George Tuttle, vice president; J. J.

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Mill Room Water
Nickel Dip Solutions
Neutralizer Solutions

A Two-Bed INDUSTRIAL *Water Demineralizer. Standard two- and four-bed units available with capacities of 200 to 1000 gph. Special units of any capacity engineered to requirements.*

you SAVE many ways...

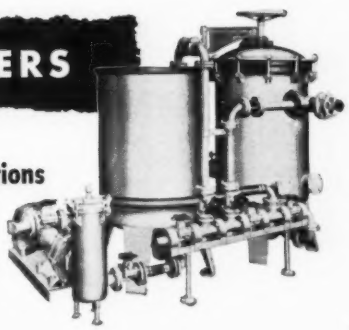
Cost analyses are proving that the use of raw water in metal coating processes is not so cheap after all. This is especially true when mineral-free water can be obtained for a matter of cents per 1000 gallons in any quantity with an INDUSTRIAL water demineralizer.

The operation is very simple. Raw water is passed through alternate beds of ion-exchange resins, and it comes out free of all mineral salts. No steam, heat, still, or cooling water is needed — keeping space requirements at a minimum.

It's simple to get the complete facts for your case. Send us a water analysis and let us know how much water you have to treat and the gallons per hour needed. We can then give you the whole demineralizer story including estimated costs, equipment required, performance data, etc., for your requirements.

INDUSTRIAL FILTERS

for Clarification of
Nickel Dip Solutions — Neutralizer Solutions
ANY QUANTITY



A Typical INDUSTRIAL *Filter. Standard portable and stationary models available with capacities of 100 to 15,000 gph. Special filtration systems engineered to meet unusual requirements.*

Write for full information and recommendations.

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.

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Chicago 12, Illinois

RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

Svec, secretary-treasurer; and Rudyard Porter, assistant secretary-treasurer.

The first committee selected was an appointments committee consisting of F. A. Petersen, Ed Bolin (past president), and George Tuttle. Four other committees were appointed consisting of program, membership, historian, and publicity.

Program committee consists of: Art Daumke, Harshaw Chemical Co.; A. B. Friedmann, Chicago Vit; Waldo Higgins, A. O. Smith Corp.; and Mel Gibbs, Inland Steel Company.

Membership committee consists of: Marcel Pouilly, chairman; Bob Tucker, Wyandotte Chemicals Co.; Art Raeuber, A. O. Smith Corp.; Leo Goldberg, Porcelain Enamel Finishers; and R. V. McEvoy, University of Illinois.

On the historian committee are: George Arras, Quadrangle Mfg. Co., chairman; Al Vodicka, Aetna Porcelain; Paul Gerdes, Hotpoint; and John Tetter, of Thompson Company.

On the publicity committee are: Art Friedberg and W. J. Plankenhorn, both of University of Illinois; Wm. Wm. Burriss, of Ceramic Industry; and Dana Chase, *finish*.

AMA PACKAGING EXPOSITION IN CHICAGO, APRIL 24-27

The National Packaging Exposition, scheduled for April 24-27, at the Navy Pier, Chicago, is expected to be almost one-quarter larger than the one held in Atlantic City last year, according to J. D. Malcolmson, packaging vice president, American Management Association.

The packaging, packing and shipping industry is well on the road this year to an annual dollar volume of more than $7,000,000,000. The record number of approximately 240 exhibitors at this year's show and the wide diversity of subject matter for discussion at the three-day Conference on Packaging, Packing and Shipping are evidence of a growing recognition of the importance of packaging to industrial operation and to the national economy, stated Malcolmson.

The attendance at the Exposition, held concurrently with National Packaging Week, is expected to include 15,000 representatives of packaging suppliers and users from all over the United States as well as several hundred visitors from Canada and representatives of more than 29 foreign countries.

Some 1000 packaging executives and specialists are expected to register for the six sessions of the Conference on Packaging, Packing and Shipping.

Tuesday, April 25, will be given over to tackling problems of packaging, packing and shipping problems. The morning session will feature a demonstration by executives and technicians of General Electric Company who will discuss the analysis and solution of specific problems. Case-history demonstrations with the actual materials and methods used will range over the entire scope of the company's products.

The afternoon session will be devoted to "More Effective Packaging and the Reduction of Loss and Damage in Shipping," with William H. Clay, Swift & Company, acting as chairman. The following subjects will be discussed:

"Loss Reducting through Modern

SPARKLER
horizontal plate
FILTERS

Good Plating Requires Clean Plating Solutions

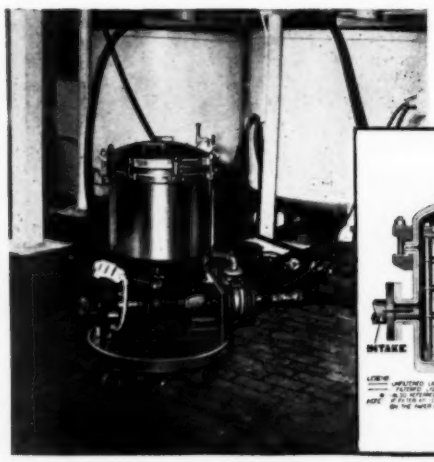
Sparkler Horizontal Plate Filters effectively remove all solids and precipitates from plating solutions—provide positive assurance that solutions are free from undesirable matter.

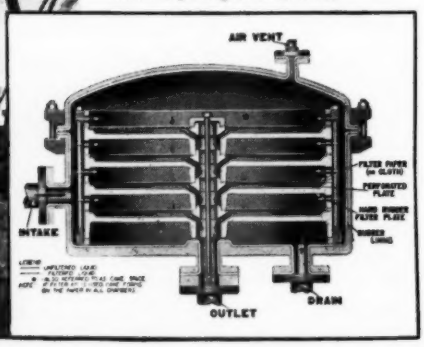
The horizontal plate principle used by Sparkler makes possible the formation of firm, stable filter cakes that will not slip or crack under intermittent or continuous flow. Flow through the filter is always *with* gravity, and filter aid is floated into position, forming a firm cake of even thickness.

The accompanying photograph shows a typical Sparkler installation in a modern plating plant. Previously, in this plant, silver chloride slurry was shoveled into crocks and laboriously washed by decantation. Now, chloride is mechanically agitated, collected, and washed in the Sparkler filter. Cost of the operation has been sharply reduced and quality of the chloride has been greatly improved.

Filters are pressure-tight and leakproof, and are available in rubber-lined construction, stainless steel, or iron. Capacities from 60 to 10,000 G.P.H.

Our Engineering Service is available for your specific problems.





SPARKLER MANUFACTURING CO.
MUNDELEIN, ILLINOIS

This Sparkler Filter is used by a large silverware manufacturer in connection with the plating of silverware.

Techniques of Carloading and Bracing," by Edward Dahill, Association of American Railroads; "Advanced Packing Practices for Shipment by Truck," by William L. Yingling, National Classification Board, American Trucking Associations, Inc.; and "Practical Developments in Packaging for Export," by Frank W. Green, industrial packaging consultant.

A Packaging Theatre, for the showing of educational films on various aspects of packaging, packing and shipping, will be in operation as a special educational feature. Approximately 20 films on up-to-date technical developments, processes, methods, materials procedures, etc., will be continuously shown during the hours of the Exposition by their consumer companies (i.e., users as distinguished from suppliers).

Tickets for admission to the Exposition, which may be used for advance registration, may be obtained upon application to the Packaging Division, American Management Association, 330 West 42nd Street, New York 18, N. Y., or at the Navy Pier, Chicago, at the time of the meetings. Those who register for the Exposition, however, will have to register separately for the Conference, it was stated.

FRED GILLIES RESIGNS FROM INLAND STEEL

Fred M. Gillies has resigned as works manager of the Indiana Harbor plant of Inland Steel Company, according to an announcement released by Clarence Randall, Inland president.

Gillies had been with the firm since 1922 and works manager of the 17,000-man plant since 1946. Randall said that H. W. Johnson, vice president in charge of steel manufacture, will act as works manager.

DE VILBISS TO ADD BUILDING TO TOLEDO PLANT

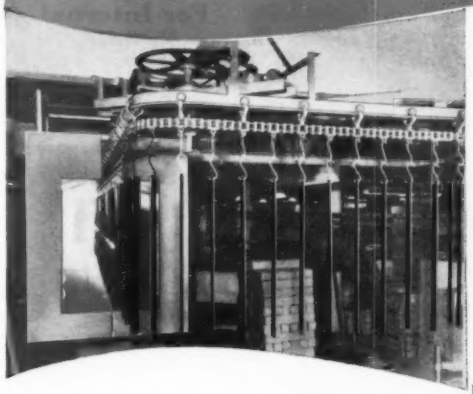
The DeVilbiss Company, manufacturers of complete spray finishing systems, will begin the immediate construction of a modern new building adjoining the Toledo plant for expansion and improvement of present facilities for customer service, according to Howard P. DeVilbiss, president.

It was stated that the improvement program will be three-fold. First, there will be ample space for demonstrating the company's products in actual operation; second, the plans provide for an expansion of the customer training school of spray finishing equipment where customers and jobbers representatives have been schooled annually for over 25 years in spray finishing techniques; and third, the full line of company products will be suitably displayed in space especially planned for the purpose.

ASTM COMMITTEE ON PORCELAIN ENAMEL STANDARDIZATION NAMES PERSONNEL OF SUB-COMMITTEE ON SPECIFICATIONS

A.S.T.M. Committee C-22, organized to work on a program of standardization of porcelain enamel, has announced the appointment of R. F. Bisbee, of Westinghouse Electric Corp., as chairman of Sub-Committee 3 which consists of three sections: (1) raw material, (2) materials in

problems?.. you have none



WITH A Jensen ECONOMY ENGINEERED FINISHING SYSTEM

That's the opinion of vice-president Edward Waltz of the E. O. Bulman Mfg. Co., in reviewing the performance of their Jensen Infrared Oven and Conveyor System shown above and installed over a year ago.

The experience of this well-known Grand Rapids maker of steel store equipment confirms that of hundreds of manufacturers who, because of Jensen *economy-engineered* conveying coordinated with proper radiant heating equipment, are producing *better, faster finishing at less cost!* You can do the same.

PROOF OF PROFIT

"We find there are many advantages to our present Jensen Finishing System"—wrote Mr. Waltz— "I list a few of these:"

- 66⅔% MANPOWER SAVINGS
- 17% INCREASED PAINTING EFFICIENCY
- REJECTS REDUCED TO LESS THAN ½ OF 1%
- IMPROVED HIGH GLOSS FINISH
- LITTLE OR NO UPKEEP

WITHOUT COST OR OBLIGATION using your products and your finishes, let us present practical proof of possible cost savings you can expect from a Jensen Finishing System.

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"DUAL HEAT" INFRARED OVENS • CONVEYORS • PAINT DIP TANKS

process, and (3) finished products. Dr. J. J. Canfield, of Armco Steel Corp., is secretary of this Sub-Committee.

Personnel of Section 1:

W. A. Derringer, A. O. Smith, chairman; E. P. Bolin, Chicago Vit, secretary; M. J. Bozsin, Ferro Enamel; J. J. Canfield, Armco; E. C. Dexheimer, Nesco; J. H. Gregory, Sears; Wm. Irby, General Electric; Frank Porter, Inland Steel; and J. B. Willis, Pemco.

Personnel of Section 2:

S. E. Hemsteger, Briggs, chairman; E. P. Bolin, Chicago Vit, secretary; M. J. Bozsin, Ferro; G. E. Campbell, Borg-Warner; Ralph Cook, University of Illinois; W. A. Deringer, A. O. Smith Corp.; J. F. Matejczyk, O. Hommel; J. A. Schiefferle, General Electric; and J. B. Willis, Pemco.

Personnel of Section 3:

J. H. Gregory, Sears Roebuck, chairman; J. C. Richmond, Nat'l Bureau of Standards, secretary; Bureau of Ships, U.S.N.; G. E. Campbell, Borg-Warner; E. C. Dexheimer, Nesco; P. R. Fritsch, Goodyear; V. D. Frechette, N.Y. State College of Ceramics; S. E. Hemsteger, Briggs; D. B. Judd, Bureau of Standards; J. F. Matejczyk, O. Hommel; L. S. O'Bannon, Battelle Institute; F. A. Petersen, University of Illinois; Frank Porter, Inland Steel; R. Skagerberg, Public Housing Authority; B. J. Sweo, Ferro; F. Tesi, Nat'l Retail Dry Goods Assn.; and M. A. Tuttle, N. C. State College.

FIBER-and-STEEL STRAP CUSHIONS AS IT BINDS

For Internal Bracing

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Prevents Shipping Damage

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Cuts Shipping Costs

FIBER-and-STEEL is steel strap with a cushion of protective Kraft paper around it. You can apply FIBER-and-STEEL directly on the enameled surfaces of stoves, refrigerators and other similar products with *no cushioning needed* between the product and the strap. The outer layers of Kraft paper protect the surface. The inner layer of steel strap binds with a slip-proof grip.

FIBER-and-STEEL saves time and materials in packing, makes uncrating easy, and leaves no adhesive stains. It is secured with a soft aluminum Gerrard seal.

FIBER-and-STEEL IS USED BY

- Crown Stove Co.
- Perfection Stove Co.
- Odin Stove Co.
- Dixie Foundry
- Norge Division
- Mt. Vernon Furnace & Mfg. Co.

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FOR A TEST DEMONSTRATION
IN YOUR PLANT

STEEL STRAPPING

A. J. Gerrard & Co.

1958 Hawthorne Place, Melrose Park, Ill.
(Chicago Suburb)

MACHINERY & WELDER APPT.

Charles Metz has been appointed resistance welding engineer for Machinery & Welder Corporation, distributors of Precision Resistance Welding Machines in St. Louis, Moline, Chicago, Milwaukee and Minneapolis.

Pressed Metal Institute sponsors technical symposium

→ *from Page 40*

Jerry Singleton, PMI assistant manager, presided at the afternoon session which closed the two-day meeting. Subjects on the afternoon program included:

"Lubricant's Part in Cold Forming of Steel," by H. J. McVey, manager, new products development, Parker Rust Roof Co.; and "Press Developments for Cold Extrusion of Steel," discussed jointly by Albert Clements, chief engineer, Clearing Machine Corp., and E. V. Crane, chief engineer, Hydraulic Press Mfg. Co.

At another question and answer panel, the day's speakers answered questions from the audience.

PMI annual meeting in Canada

It was announced at the meeting that the annual membership meeting of the Pressed Metal Institute will be held September 11-16 at Hotel Tadoussac, Saguenay and St. Lawrence Rivers, Montreal, Canada. Reservations should be sent to the Pressed Metal Institute, 13210 Shaker Square, Cleveland 20, Ohio.

Titanium enamel direct to titanium steel

(Continued from Page 61)

.08 and .12 grams per square foot.

(You will note that the nickel deposit was raised over the original requirement of .05 grams per square foot; this was found necessary to insure the best possible adherence.)

Control methods for nickel

To enforce the exacting nickel requirements, it was necessary to hire a chemical control man on each operating shift with duties as follows:

1. Make control checks on both pickle machines on hourly basis.

2. Maintain solutions to correct concentrations and levels.

3. Check temperatures and control at specified range, also maintain filtering of nickel and neutralizer tanks, and check clarity of filtered solution each shift.

4. Make nickel coating weight sample panels on each shift to be tested by chemical laboratory daily and recorded.

5. Make enamel torsion test samples every shift for chemical laboratory tests.

6. Make similar tests as in (5) and test each shift for routine control tests in enamel department laboratory for adhesion.

About April 1, 1948, a frit was submitted which enabled production to start 100% on titanium steel using our standard time and temperature cycle. This enamel was somewhat rough on first fire, but smoothed out nicely on the decal fire and was satisfactory as a stop-gap material for approximately 61,000 platforms.

The elimination of the decal fire for 1949 models forced the frit development so that a short time before the actual production date, an improved enamel was available and has been used to date with only minor modifications. Production is* now nearing the 200,000 mark and just recently a second source of enamel frit has been approved.

In addition to the processing of this quantity of heater platforms, the following projects for additional use have been completed:

1. 100 ranges complete in all parts.
2. 200 food compartments.
3. 50 crisper pans .025 steel.
4. Laundromat front tubs.
5. Water heater tops.

The results of these samples indicate that the process is adaptable to most existing designs and manufacturing methods. However, the possibilities are even much greater if the product engineer starts from drafting board and utilizes to full advantage the properties of this combination of steel and enamel.

The production record of 500 platforms in 1947, 61,000 in 1948, and 150,000 in 1949 is evidence to the industry of the progress made to date. This record can serve also as an index to what can be expected of this process in the future of porcelain enamel.

**(when report was prepared — quantity is much greater at publication date)*

as simple as **A·B·C**

These components for the completely enclosed pipe-line type FerroFilter shows its simplicity of design. Simplified design, careful workmanship, and the finest materials are combined in an extremely effective electromagnetic separator that will give you long, trouble-free service.

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C O R P O R A T I O N

Baltimore 24, Maryland

Always Begin With a Good Finish

Pacific Coast enamelers discuss color-matching

by Malden Grange Bishop • CORRESPONDENT

PRESIDENT Joe Disario presided over one of the largest meetings of the Pacific Coast Enamelers Club held at The Clock, South Gate, California, February 10. Glen B. Fulton, membership chairman, rode herd on the drove and branded each member with a gleaming new membership button.

Marshall H. Odeen, application development engineer, National Technical Laboratories, South Pasadena, took the floor immediately after dinner to speak on "Electronic Control Equipment for the Enamel Plant." With the aid of two assistants, R. W. Moulton and Dr. W. S. Gallaway, together with slides and models, Odeen discussed and demonstrated the application of the spectrophotometer in color-matching.

Traditionally, color-matching has been an art, an art wholly dependent upon the human eye. But the human eye is very limited. It is limited by its own poor color sensitivity and spectral range, and by the physical and psychological factors of the particular individual. "Industry does not want art," Odeen stated. "Industry wants and must have exactness."

Definition of "color"

Color can be defined simply as that which the eye sees, excluding pure blacks, whites and greys. Although man has always known that he was affected by color, he has not known what caused and affected color itself. Science has now learned that color is affected by (1) the nature of the light cource, i.e. the quality of the sunlight, artificial light, etc., which illuminates the object, (2) the nature of the object, or the reflectant or absorption characteristics of the object, and (3) the nature of the eye viewing the object, or the spectral sensitivity of the particular individual.

It was less than 300 years ago that Newton's prism revealed for the first time that sunlight is a combination of all colors. For more than 200 years no one made any practical use of this discovery, and it has been only within the last few years that spectrophotometry has come forward to measure individual colors, and to provide a simple means of plotting the curve of any given color—a curve which is as unique for that color as the fingerprints are to an individual person.

True color differences exist because of the varying degree of subtraction of some wave lengths by modifiers, such as organic pigments and dyes or certain inorganic salts, which may be present in the object. The eye, however, sees—not true color differences—but only apparent color differences because of the effects which both the illuminating light and the eye itself produce on true color. The distinction between true and apparent color is simply demonstrated by comparing the spectrophotometric curves of two colors which have been visually matched under a given illuminant. If the colors are the same their spectrophotometric curves will coincide. However, unless the color of the illuminating light is a pure white and the human eye making the match is possesed of unusual sensitivity, their spectrophotometric curves, or spectra, may not show any resemblance whatsoever.

Sunlight, which is often regarded as the best light for color-matching, is normally considered a white light. Actually, according to astronomers, sunlight is a relatively yellow light. It is subject to all sorts of modifiers in the atmosphere and its color is constantly changing. The human eye, on the other hand, varies widely between individuals in its ability to receive all of the wave lengths comprising the visible spectrum. The eye is particularly insensitive to deep blues and reds, i.e. the wave lengths in those regions of the spectrum near 400 and 700 millimicrons.

Here, then, is the impossible difficulty of color-matching by eye. Although the matching may be perfect to the human eye, unless the true colors have been shown by the spectrophotometer to be the same, the colors will change and are poorly matched as the illumination is changed. While the eye can at best match for a given illumination there can be no assurance that the same match will hold for all conditions of illumination and for the eyes of all individuals.

The spectrophotometer solves this problem easily and accurately. By showing that any two colors have the same spectrophotometric values — their spectral curves coincide—it is known with certainty that those two colors will match under all conditions of illumination and to all human eyes viewing them.

In addition to color differences which are caused by the subtraction or selective absorption of some wavelengths, the object producing the color affects the intensity of the color, and the variations of the surface of the object affect the reflectance and the diffusion of the light striking the surface. The eye cannot adequately cope with these additional factors and is most likely to "see" a color difference where actually the difference may be one of intensity or surface effects.

The spectrophotometer overcomes these limitations of the eye, as well, since it is an entirely objective and quantitative measuring device. Further, some spectrophotometers are specially designed so as to eliminate the "specular" reflectance produced by undesirable surface effects.

Possibilities for spectrophotometric applications in the enamel plant include the accurate prediction of pigment formulation from a submitted sample, evaluation of temperature and period of firing to produce a desired color, maintenance of standards, color-matching of the finished product against suitable standards, determination of proper thickness of an enamel coat, evaluation of com-

to Page 78 →

Filtering and straining paints and varnishes

(Continued from Page 26)

outlet pipe, and a better and more uniform quality is being maintained. The choice of the filtering machine is important here—it should be easy to assemble and clean, and above all it should be so designed that any type of media that is indicated is readily interchangeable in the filter—be that felt, paper, cloth or wire mesh.

In the filtering of varnishes and paints, it is always important to eliminate any unfiltered residue or heels at the end of a run. Usually this is accomplished by blowing the filter down with CO_2 gas. If your filter is of proper design this can be done very successfully. This however, should *never* be done with compressed air because it represents a very dangerous explosion and fire hazard. (Spontaneous combustion may be caused by friction of the air passing through the filter cake.)

The paint and varnish industry has made many advances in the improvement of their products from a clarification viewpoint and may be justifiably proud of its accomplishment.

The cold extrusion of steel

(Continued from Page 48)

cases, fuzes, primers, packing containers and a multitude of other items. Of total Army Ordnance consumption, ammunition used approximately 65%. Of total Army needs, Ordnance used approximately 75%. During a typical quarter of the last war, the Munitions Board allocation of steel to manufacturers of high explosive and chemical shell alone amounted to about 5½% of the total steel production of the nation.

The first government investigation into cold extrusion was through an Army Ordnance contract with Heintz Manufacturing Company to "have the contractor furnish the Government certain Shell and Casing, Burster, manufactured by the cold extrusion method developed in Germany and investigate the method thereof thoroughly". This contract entered into in June, 1946, was completed in July, 1947, with the submission of their Summary Report and a quantity of 20 mm M97 HE shell and M1 burster casings. Contractor was furnished a triple action German Schuller press as well as the services of four German specialists: Dr. H. Kopp, Dr. Ludwig Schuster, Hans Fischer, and Fred Flessa.

This work was later supplemented by another contract whereby Heintz Manufacturing Company applied the techniques they had developed to a 3.5" rocket motor and an experimental 75 mm projectile. The intent of this project was to investigate the application of cold extrusion to larger work pieces and higher carbon and alloy steels, also the amount of cold reduction obtainable within a single extrusion operation and the physical properties resulting therefrom.

During the development of an experimental 65 mm HE projectile, Mullins Manufacturing Company applied the principles of cold extrusion to the shaping of the shell body. At a later date the same facility manufactured an 81 mm mortar shell body by cold extrusion.

Norris Stamping and Manufacturing Company used cold extrusion for the manufacture of the plug of an experimental 105 mm mortar shell body.

Current contracts

A pilot lot of shell, 105 mm, M1, manufactured by Mullins Manufacturing Company, has already satisfactorily passed all ballistic and metallurgical tests and they are now proceeding with the manufacture of approximately 500 shell which we will need for more extended tests. An additional 500 shell to be furnished under this contract are awaiting the installation of a special 3000-T long stroke high speed press now being installed at Mullins. This same press is being used experimentally on the 4.5" rocket and will be available for investigating the manufacture of the 155 mm HE shell body. We have every reason to believe that with higher ram speeds we will be able to extrude with less pressure and extend the life of our dies; this will be investigated by means of this new press.

The 105 mm cartridge case, M14B1, is being made by Heintz Manufacturing Company. Heintz is doing some pioneering in the application of cold extrusion to a large case starting from bar stock. The largest case that we can find that the Germans made from bar was the 40 mm. Their larger cases are understood to have been made from plate by the disc, cup, forward extrusion and draw method or by deep draw methods alone. Some problems have been encountered in their work but some time this month they expect to have more samples ready for firing tests, after which we expect to be able to define the combination of materials and process that will give us cold extruded cartridge cases that will work satisfactorily.

20 mm cartridge cases, M21A1B1 are being produced experimentally by Stoner Manufacturing Company. Samples have been processed through all operations. Ballistic tests have yet to be performed.

Metroloy Corporation is in the process of manufacturing an experimental 60 mm mortar shell using cold extrusion techniques.

Mullins Manufacturing Company is in the process of making a 4.5" experimental rocket motor and head, 1-pc. by the cold extrusion process.

Norris Stamping and Manufacturing Company is using cold extrusion techniques for making the cup of the Navy's 3"/50 steel cartridge case.

Curtis-Wright Aeronautical Corporation has done considerable experimenting into the hot extrusion of steels and has even proposed that the 57 mm and 75 mm recoilless rifle bodies could be extruded complete with rifling.

In developing the optimum method of fabricating the caliber .50 steel cartridge case, Frankford Arsenal is investigating the applicability of forward extrusion to replace drawing operations, and National Machinery Company is working with the arsenal on the backward extrusion of cups.

→ *from Page 45*

reboiling. Normal reboiling after a wet-hydrogen anneal of the metal also indicates that neither carbon nor nitrogen causes reboiling. Slow cooling and slow heating of enameled steel decrease the capacity to reboil, apparently by transfer of hydrogen from the metal to the enamel. However, rapid reheating to enameling temperature obliterates the effects of earlier heat treatments.

7. *Distribution of Hydrogen in the Steel-Enamel System*

H. M. Davis, J. H. Keeler, and P. K. Chu, Pennsylvania State College, State College, Pa.

It is observed that properly controlled cooling of enameled sheet steel can prevent all delayed defects, or both delayed defects and reboiling, and that sufficient aging between 200° and 400°C. is similarly effective; but that reheating the system to enameling temperature eliminates the effects of all previous heat treatment.

A mechanistic explanation of these observations is offered. Two types of rifts or voids in the steel are postulated, one being isolated, the other having connection with the surface and, thus, with the enamel. Delayed defects are caused by the accumulation of hydrogen in interfacial discontinuities, probably partially fed by the open rifts. Hydrogen for reboiling comes largely from the isolated rifts, escaping into open rifts because of the temperature-pressure increase. In regulated cooling or in aging, hydrogen from the steel reduces metallic oxides in the interfacial zone to form water, which is stored in the glass structure. Refiring reverses the process, restoring hydrogen to the steel.

Tuesday Afternoon, April 25

8. *X-Ray Diffraction Study of the Oxidation Characteristics of Nickel Pickled Sheet Iron as Related to Enamel Adherence.*

J. M. Zander and G. S. Douglas, Chicago Vitreous Enamel Product Co., Cicero, Ill.

Identification is made by X-ray diffraction of the iron oxide formations and the relative amounts produced in firing ground coats at various temperatures on plain and nickel dipped steel. Conventional and low temperature ground coat enamels are applied and fired over the range of 1325° to 1550°F. and 1250° to 1475°F. in 75° increments respectively. These data are discussed in connection with existing adherence theories.

9. *A Study of Fishscale Produced by Induction of Hydrogen into Enameled Iron*

E. E. Bryant, B. J. Sweo, G. E. Miller, and M. L. Simmons, Ferro Enamel Corp., Cleveland, Ohio

Fishscale is produced by treatment with acid and direct current injecting hydrogen into the reverse side of the samples with the time required to produce the first fishscale being used as a measure of resistance to fishscale. All tests are made with cover coat over ground coat. When ground coats have good adherence, thin application, overfire and lack of enamel on the back side reduce resistance to fishscale. The cover-coat system of enamels has an effect on resistance to fishscale. Firing range studies on ground coats show a characteristic variation which correlates fairly well with hydrogen held in the iron samples after enameling at the same temperature. Adherence on the P.E.I. adherence meter does not correlate with resistance to scale. Bubble producing clays in ground coat increase resistance to scale but variations in bubble structure produced by other means may not necessarily produce better resistance to scale.

Since fishscale in this test is produced by diffusion of hydrogen through steel, diffusion through steels and evolution from steels was investigated. Resistance to scale could not be correlated with diffusion or evolution of hydrogen.

10. *Results with the P.E.I. Adherence Meter*

H. W. Afflerbach and Clark Hutchinson, Ingram-Richardson Mfg. Co., Frankfort, Ind.

A new test for measuring adherence has been developed by the Products Standards Committee of the Porcelain Enamel Institute. As yet this test is still in the "try-out" stage in several laboratories in co-operation with the P.E.I. This paper illustrates various applications of the test by one laboratory.

Wednesday Morning, April 26

11. *Some Factors Affecting the Opacity, Color, and Color Stability of Titania-Opacified Enamels*

Robert F. Patrick, Pemco Corp., Baltimore, Md.

The types and relative amounts of crystalline material in titania enamels are discussed. The effects of the form and size of titania crystals on the opacity, color, and color stability of these enamels are described. The presence of minor amounts of foreign ions incorporated in the lattices of the titania crystals is found to affect the color substantially.

12. *Some Further Observations on the Effects of Mill Additions on the Color Value of Titania Enamels*

Edward E. Marbaker, Mellon Institute, and Hollis S. Saunders and Leon N. Baumer, The O. Hommel Co., Pittsburgh, Pa.

Experiments additional to those described in "Effects of Some Electrolytes on Color Value of Enamels Made from a Standard Titania-Opacified Frit," *J. Am. Ceram. Soc.*, 32 [9] 297-304 (1949) were carried out to determine the effect of smaller amounts of some of the electrolytes which had produced too much set. The influence of such additive compounds as urea and tinting oxide, different kinds of clay and clay and bentonite, with a given electrolyte; and different amounts of clay with a given electrolyte, were studied. The heat stability at high firing temperatures of enamels made from several frits with the same mill additions and a given frit with different mill additions was determined.

13. *Effect of Crystallized and Dissolved Titania on Colored Enamels*

N. K. Russell, A. L. Friedberg, and F. A. Petersen, University of Illinois, Urbana, Ill.

A study was made of the spectrophotometric characteristics of a clear and an opaque titania bearing enamel. Additions of 3 and 6% of green, brown, and red stains were made to the enamels. After firing at various times and temperatures spectrophotometric and X-ray data were obtained.

14. *The System Na_2O–P_2O_5–Al_2O_3–B_2O_3 as a Possible Base for Low-Temperature Titania-Opacified Porcelain Enamels*

L. R. Blair and M. D. Beals, Titanium Pigment Div., National Lead Co., South Amboy, N. J.

The region of glass formation in the system Na_2O–P_2O_5–Al_2O_3–B_2O_3 has been established at levels of 10, 20, 30, 40, and 50 mole % Na_2O. The compositions examined were restricted to those which could be melted easily (at temperatures < 1500°C.), and to those which could be compounded without the use of phosphoric anhydride or phosphoric acid as a source of P_2O_5. Sufficient titanium dioxide to develop opacity during firing was then added to those four component glasses which possessed a reasonable degree of acid and water resistance and the resulting enamels evaluated from a standpoint of firing temperature, acid resistance, color, and gloss. Compositions have been found which can be fired at temperatures in the range 675° to 725° C., have class AA acid resistance, good opacity, and whiteness. Their chief disadvantages are poor alkali resistance and a high coefficient of thermal expansion.

Wednesday Afternoon, April 26

15. *Wetting Properties of Some Enamel Glasses and Relation to Impact Resistance*

W. J. Knapp, University of California, Los Angeles, Calif., and C. C. Shah and T. J. Planje, Missouri School of Mines, Rolla, Mo.

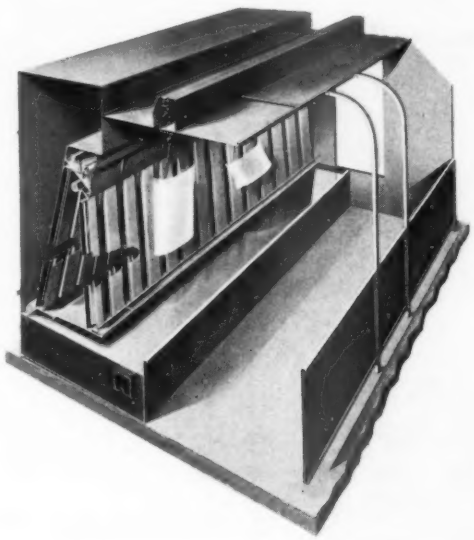
The wetting properties of some enamel glasses on commercially pure enameling iron were determined and compared with correlated impact resistance test results. Wetting properties were studied by means of a modified sessile drop method. The rate of change of wetting characteristics with temperatures seemed to influence the impact resistance of the enameled metal.

16. *Viscosity Studies in Titanium-Bearing Porcelain Enamels*

Werner Heimsoeth, Luverkusen-Beyerwerk, Germany.

New Supplies and Equipment

D-50. New type spray booth for enamels, lacquer, paint, and varnish



A new spray booth has been designed to reduce cleaning and maintenance requirements, and to eliminate the necessity for periodic interruptions in production to permit removal of paint sludge from the surface of the solution in the charging tank.

A new vertically fluted flood sheet, consisting of a staggered front and rear section, permits passage of air through the flutes and creates an even suction over its entire flooded area. Front and back sections are designed to produce eddying traps which remove the bulk of the overspray at this point. The remainder of the overspray is struck from the air by torrents of chemically treated water in rear of the flood sheet. Water eliminators remove the entrained water from the air.

Twice the amount of water is circulated at one-half the static pressure required in former models.

Sludge disposal problems have also been solved in this new spray booth. Particles of paint forming into a sludge on the surface of the charging tank move constantly, due to an induced water current, toward and over a weir into a jet eductor chamber where the sludge is picked up as fast as it accumulates and conveyed hydraulically to an automatic sludge segregator and unloader, which may be located in any convenient place in relation to the spray booth.

This new spray booth can also be furnished in the "downdraft" type, for floor conveyor systems.

D-51. New process for improved aluminum castings

A process for producing brighter, smoother, more durable aluminum permanent mold castings has been announced. According to the manufacturer, the "Velvaglaze" process actually provides a denser surface

through its ability to seal the pores of the casting and increase wearing qualities.

Initial tests were said to indicate that the process retards and, in some cases, resists corrosive action to a degree not possible to obtain on ordinary commercial aluminum casting.

The process is claimed to be ideal for certain products, among which are the agitators used in automatic and wringer-type clothes washers. It was stated that the finish "resists the corrosive action of hard water, harsh soaps or detergents."

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Pacific Coast enamelers...

→ *from Page 70*

peting products, and many others. Only the spectrophotometer, which is objective and quantitative and which possesses greater spectral range than the eye and far greater sensitivity over the 400 to 700 millimicrons band of the human eye can cope with the infinite variations of color produced in modern industrial color processes.

After the meeting was adjourned, Odeen took two specimens of enamel supplied by Roy Armour and which appeared to be the same, and with a spectrophotometer he plotted curves on the specimens to demonstrate their differences.

Mike Bozsin, of Ferro Enamel Corporation, and secretary of the Central District Enamelers Club, was welcome as a guest of the Pacific Coast's club. At a question and answer session he explained his experiences with various furnace temperature problems of enamelers across the country, and concluded with the reminder that no furnace problem is new. "And the methods of analysis of your problems is no secret," Bozsin said. "Every problem I have run into, I later find, is already analyzed in some book on the enameler's desk."

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